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# electrical contracting

*Maintenance  
Section*

PAGES 37-48

1940  
**HOW ABOUT**

If you want to make it prosper—you can. It's just a matter of what you do with it. What can you do? Turn to Page 9 and study the possibilities.

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**JANUARY • 1940**

**You're Missing Something  
If You Haven't Tried**

# **THIS NEW G-E TIME SWITCH**

**B**ECAUSE it's smaller, simpler, easier to handle, and easier to wire than any general-purpose G-E time switch you've ever seen! It's the new Type T-44.

#### **SMALLER—SIMPLER**

This latest addition to our time-switch line is small enough to handle with one hand, yet it has plenty of wiring room for quick, time-saving, profitable installation.

Its sturdy, streamlined case is in keeping with modern design. It can be used either outdoors or indoors, and it is attractive to look at when installed in full view.

#### **SIMPLE CONSTRUCTION—TELECHRON MOTOR**

Electric drive is supplied by the well-known Telechron motor—the precision motor of America's best-known electric clocks. Contacts are of silver, conservatively rated at 35 amperes (including Mazda inrush). And because of improvements in time-switch design, the new Type T-44 offers you simpler operation—there are fewer parts, fewer places for trouble.

#### **EASY WIRING**

You get a lot of wiring advantages with the new switch, too. Five standard knockouts, plenty of wiring room, clearly indicated connections, side hinges—all these features contribute to a quick wiring job, a profitable installation.

Your nearest G-E office will be glad to supply you with a copy of the descriptive bulletin on this new time switch—Publication GEA-1427K. Or write General Electric, Schenectady, N. Y.



**Type T-44  
General-Purpose**

**GENERAL  ELECTRIC**

440-132

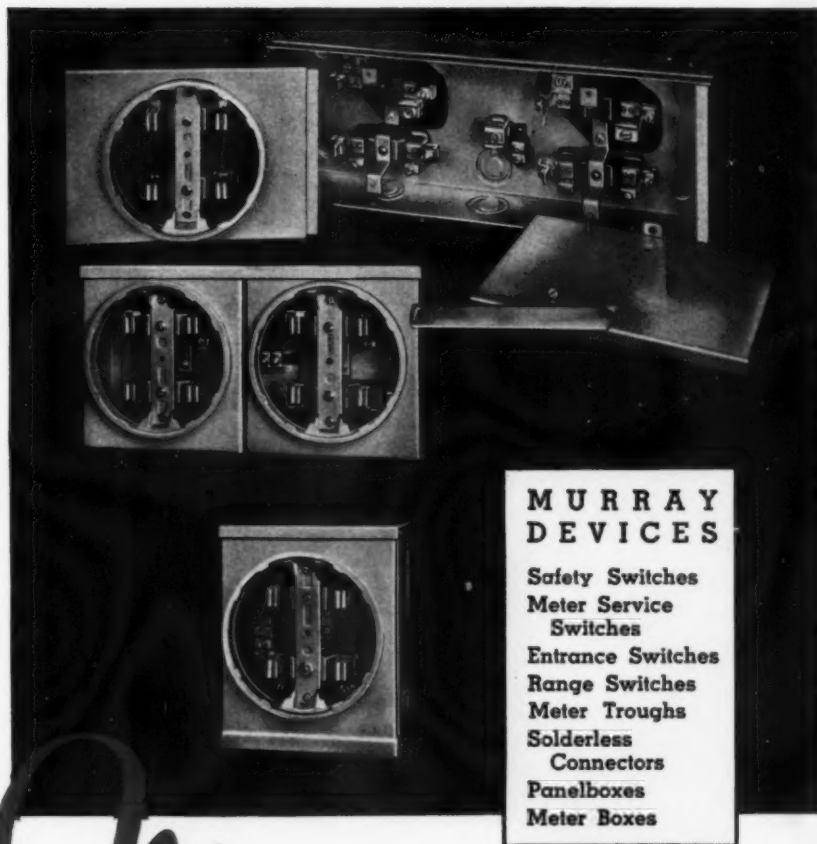
*Electrical Contracting, January 1940*

Never before  
SUCH *Easy* INSTALLATION  
-NOTHING ELSE SO *Modern*

**I**F there were no service wires, it would just be a case of "hang 'em an' forget 'em."

But with knockouts all around and quick-acting, ever-tight Murray Solderless Connectors, installation is child's play. It's over and done with before you can say, "Jack Robinson."

Every feature of Murray Troughs is *modern*. There's a type for every purpose. The troughs are practically indestructible and in cases of need, access to them is quick and easy. Send the coupon for all the facts; for the reasons why it is good business for you to install Murrays. Metropolitan Device Corporation, Brooklyn, N. Y.



**MURRAY  
DEVICES**

Safety Switches  
Meter Service  
Switches  
Entrance Switches  
Range Switches  
Meter Troughs  
Solderless  
Connectors  
Panelboxes  
Meter Boxes

*Murray*  
**TROUGHS**  
*for socket-type*  
**METERS**

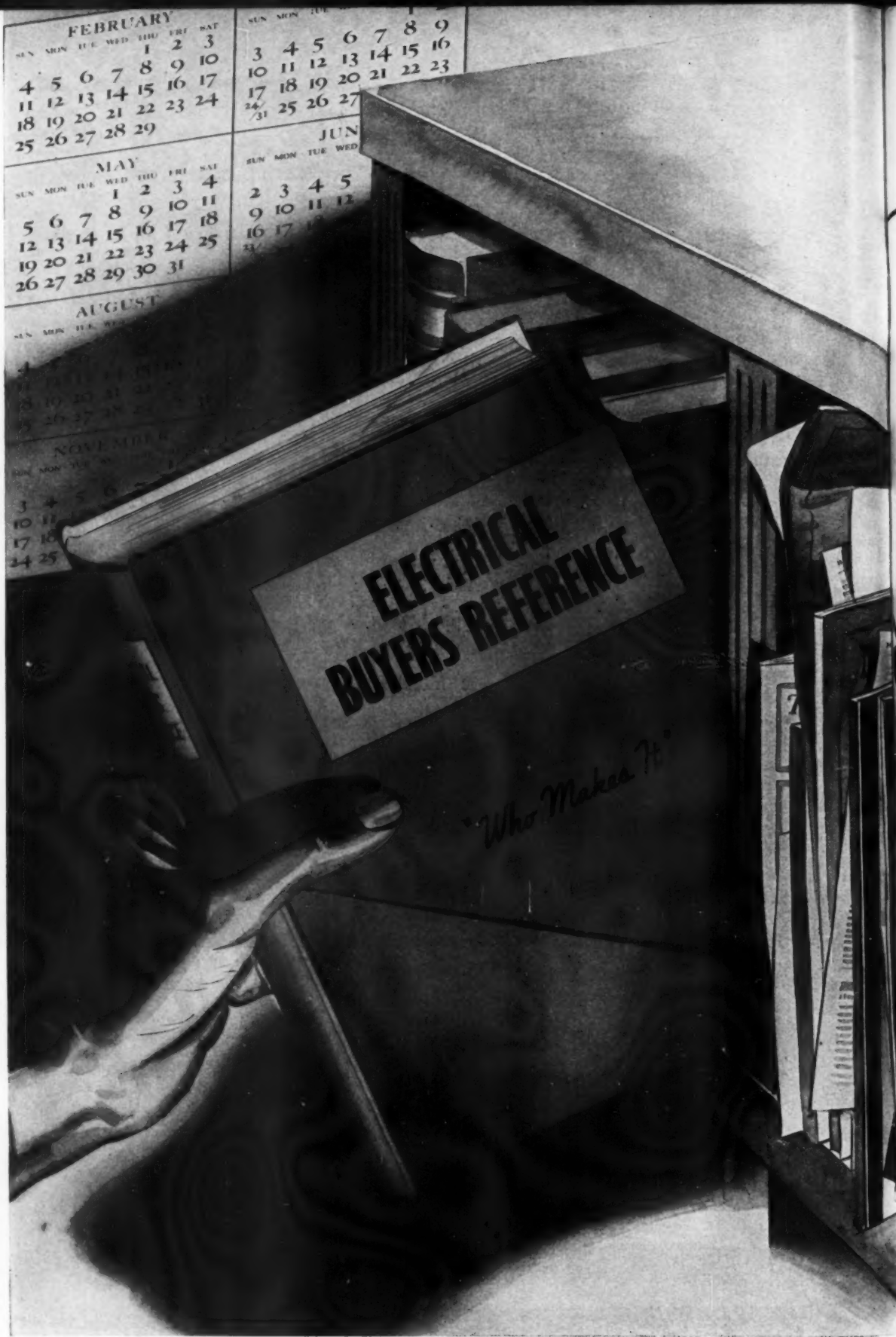


Metropolitan  
Device Corporation  
Brooklyn, N. Y.

Gentlemen: Please send me  
free of charge and without  
obligation, 20 page Murray Meter  
Trough catalog.

Name \_\_\_\_\_  
Title \_\_\_\_\_  
Company \_\_\_\_\_  
Address \_\_\_\_\_

# YOUR "LOOKING UP" PLACE FOR 1940





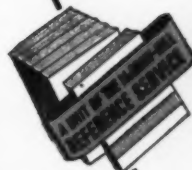
# To Help You Plan, Specify, Requisition and **BUY** Electrical and Allied Products . . . . .

The 1940 Edition is just off the press filled with up-to-the-minute buying information for electrical men. It contains a completely revised classified index of manufacturers, company and trade names, and manufacturers' product exhibit section—all cross-indexed so that you can quickly find the answer to your buying problems. Sturdily bound in stiff cloth covers for year 'round usage.

Use your copy throughout 1940 to save time and money!

## Electrical **BUYER'S REFERENCE**

\* THE LOOKING-UP-PLACE FOR EVERYTHING ELECTRICAL \*  
McGraw-Hill Publishing Co. • 330 W. 42nd St., New York, N.Y.





## The New BENJAMIN STREAM-LITER is creating even greater enthusiasm for Fluorescent Lighting

Orders now pouring in from all over the nation give proof that the new Benjamin Stream-Liter is the answer to the demand of industry and commerce for a fluorescent unit for general illumination and localized lighting in both plant and office.

Here is a new type of lighting unit using the latest developments in Fluorescent lamps and auxiliary equipment. It provides, economically and efficiently, a new type of lighting utilizing the color quality and high lumen output advantages of the Mazda Fluorescent DAYLIGHT or WHITE lamps.

It provides restful, comfortable lighting. It greatly improves seeing conditions; increases visual efficiency and reduces eye strain. It is especially adapted to the lighting of industrial establishments, offices, work shops and other industrial and utilitarian applications. Ask your Benjamin distributor for a demonstration of this new lighting fixture and for complete information about this Benjamin Stream-Liter and the other new Benjamin Fluorescent Lighting Units. Benjamin Electric Mfg. Co., Des Plaines, Illinois.

- 1 Conforms to the new RLM specification and has RLM Label.
- 2 Highly efficient and durable porcelain enameled reflector, 78% reflection factor.
- 3 Lamp adequately shielded from direct view by reflector with cut-off of 72½ degrees.
- 4 Total light output efficiency of unit 78%.
- 5 Additional shielding and increase in light output efficiency by closed ends.
- 6 Well diffused quality of illumination with soft luminous shadows and uniform distribution of light.
- 7 New type two-lamp auxiliary—power factor 95 to 99%.
- 8 Flicker reduced to minimum.
- 9 Equipped with starter switch of renewable type located in new type socket and easily accessible.
- 10 Easy to install—special hinged hook arrangement simplifies wiring and inspection.
- 11 Easy to clean and maintain.
- 12 Has Underwriters' Label of Approval.

# BENJAMIN

## LIGHTING EQUIPMENT

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Benjamin Elec. Mfg. Co.,  
Des Plaines, Illinois.

Please send me Catalog Page and Specifications on the new Benjamin RLM Stream-Liter.

Name.....

Title.....

Company.....

Address.....

City..... State.....

# electrical contracting

With which is consolidated The  
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Established 1901

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A SERVICE PAPER for electrical contractors, engineers, motor shops, industrial electricians and inspectors, covering engineering, installation, repairing, maintenance and management, in the field of electrical construction—industrial, commercial, and residential.

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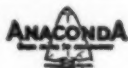
*[ Make it happen to you! ]*  
**\$2600 job goes to contractor  
 who makes wiring survey—customer boosts  
 annual profit \$4800 as result**



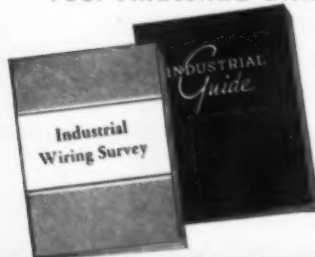
*They turn out the lights  
 when they leave—show them how to stop  
 invisible electrical leaks that cost far more!*

A lot of industrial plants are saving sizable amounts of money through "turn-off-the-light" programs. But, according to authorities, nine out of ten of those plants are losing what they save—and more—by putting up with inadequate electric circuits...circuits that overload and cause voltage drops and the invisible "evaporation" of power.

And here's where you come in. You have the equipment and experience to show any of those nine out of ten plants exactly where the bad circuits are and how to fix them. The only thing missing is the survey plan. And that's no problem.



**Your Anaconda Distributor Will Help You**



Contractors everywhere are finding that it pays to solicit industrial modernization contracts. Now is the time to plan your sales activities so as to reduce "repair work" and build up modernization. The material you need to develop industrial wiring is available without cost. See your local Anaconda distributor for complete sales plan and copies of the "Wiring Survey" booklet.

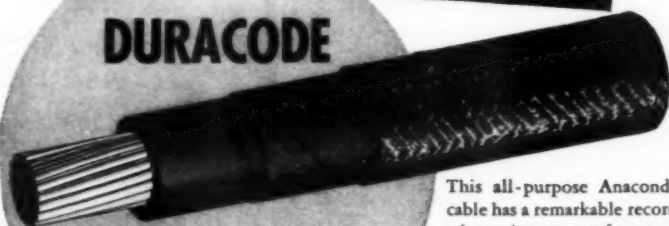


*Industrial analyzer in use. Equipment like this can help you win modernization contracts. Photo courtesy Westinghouse Electric & Mfg. Co.*

The customer in this case is a mill down in Georgia where over a period of years additions and changes to take care of increased production had caused electric circuits to become seriously overloaded. A local contractor made a complete wiring survey. Based on the survey, he won a contract for an entire new distribution system worth \$2600. As a result, the customer increased production 3% which meant a profit boost of \$4800 a year.

DB017

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**an Anaconda Cable with  
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This all-purpose Anaconda cable has a remarkable record of continuous performance without a single reported failure... Clearly marked every foot for easy identification... Write for data on Duracode.

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JANUARY, 1940

## Your Platter

CHINESE MERCHANTS, THEY SAY, pay all their debts on New Year's Day and start afresh. I have another quaint custom. I call in my secretary on January 2nd and apologize for all the casual cursing I shall do throughout the coming year. This pleases her—and it leaves me free to enjoy the priceless privilege of self expression.

NEW YEAR'S HAS ANOTHER VALUE. It is a good point for looking ahead. And this time the electrical contractor has something big to look ahead at. For by approving thin wall insulation, the Electrical Committee NFPA has just dished up a rich new market and put it on a platter for us.

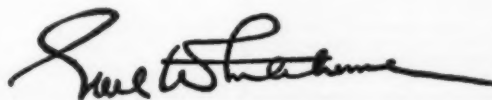
ALL OVER THE COUNTRY tenants in commercial buildings have been complaining about poor light, demanding more power for ventilation and air conditioning. Nothing could be done. Conduits were full. Owners would not chop their ceilings out and pay the high costs of re-piping for bigger capacity. Modernizing of electrical systems in stores, theaters, hotels, office buildings and institutions has been at a standstill.

AND NOW THE JAM IS BROKEN! We can pull out the old wires and pull in 80 percent more capacity. We can do this in every city, in every building, where tight conduits now make trouble. It presents the electrical contractor with more business than he has seen since all America was wired up the first time.

HOW WILL WE GET IT? That's easy. Every old commercial customer now becomes a Class A prospect. We need only carry him the good news, survey his building, show him where he saves and what he gains, secure the order, do the job. Then go on to other buildings.

ABOVE ALL, GET THESE TWO POINTS CLEAR—This is not to be hard selling. We will be bringing these owners something they have wanted and could not get. Also, each job will be substantial—embracing new circuit wire and more fixtures, fittings, devices, panels, load centers, feeders—right back to the service.

THE NEW YEAR IS READY. The wire is ready. Local approval can be secured, pending the publication of the new Code. The business is ready. It's on your platter. The only question is—Are you ready to enjoy it? There is no finer self expression than this.



# CUT DOWN ON UNPRODUCTIVE HOURS...

by using the

## GraybaR "one-call" Supply Service



"Graybar's all-inclusive supply service saves me hours of shopping around, and leaves me more time to solicit new business."

—said Contractor G—M—  
(No. 2 of a series of 10-second "quotes" from typical Graybar customers.)



Graybar stocks a full line of fuses, gives prompt service on standard or special types, sizes.



Graybar friction tape and rubber tape give you advantages of clean workmanship, unflinching insulation.



Switches, flush plates, receptacles, fittings—Graybar has complete stocks of the preferred types.



When you need wire and conduit, why wait for long distance shipments? Graybar stocks are complete.



Motors and motor controls, circuit breakers and other items for industrial jobs are immediately available.



Silvray lighting fixtures are the popular line for stores, offices, institutions—profitable, too. A lamp contract with Graybar is another profit-maker.

Piecemeal buying steals your time and leaves fewer hours for supervising your work and soliciting new business. Now that busier days are here, these unproductive hours mean an out-of-pocket loss that can't be offset, even by the discovery of an isolated "bargain" now and then.

That's why busy contractors in every community are consistent GRAYBAR customers. They know that a single call will bring them all the needed construction items for any job: conduit, cable, fittings, tape and all standard tools and wiring supplies. What's more, they can count on their GRAYBAR man to keep them informed of new and improved equipment and accessories,

sound products that fit in with their own operating methods.

Behind the GRAYBAR man, too, is a well-stocked local warehouse, one of 82 throughout the nation, with the extra efficiency in purchasing, service and delivery methods that such wide-range experience brings to light. Yet because GRAYBAR is interested *only* in distribution, it's been built up on a personal service basis, successful nationally only because each branch thinks first of its responsibility to local customers like yourself.

The next time you have an order to place, why not see how much you gain by sending a single, all-inclusive purchase order through to GRAYBAR?



OFFICES IN 82 PRINCIPAL CITIES • EXECUTIVE OFFICES: GRAYBAR BUILDING, NEW YORK, N. Y.

# Our Business in 1940!

By EARL WHITEHORNE

SOME months ago, the National Electrical Manufacturers Association invited me to come before their recent annual convention in Chicago. They wanted a frank appraisal of the NEMA Business Development Program. They wanted a checkup on what they have accomplished and what they are trying to do.

Now, an invitation to come and be critical is not without its liabilities. But I took it on. In preparation, a careful analysis was made of the potential business for the electrical manufacturers in the five markets where NEMA is now conducting promotion campaigns.

Of course, these are mere estimates. Nobody knows. And any figures you might set up are subject to innumerable influences that may make them more or less. But these figures were compiled by men whose judgment in these matters is sound. They were carefully calculated for the purpose of establishing a sensible figure. Then to be conservative, the totals were reduced by half.

Here's what we got—And as you read the figures, think of their relation to the electrical contractor. This is the total additional business apparently obtainable annually in these five fields, over a period of ten years—

**Prosperity stares us in the face—  
What shall we do? A frank look  
at the prospect ahead of the  
electrical contractor—the markets  
waiting to be served—the  
problems waiting to be solved.**

1. Rewiring of buildings..	\$150,000,000
2. Modernization of kitchens .....	100,000,000
3. Industrial electrification.	300,000,000
4. Rural electrification....	200,000,000
5. Safety lighting of highways .....	20,000,000
Annual total	\$770,000,000

This is a sizeable total and it looks even bigger when you multiply it by ten. And it is interesting to consider that the combined total present volume of all the manufacturers who are members of NEMA is \$750,000,000 a year. So the possible new business waiting in these five markets alone offers more than the entire present business of the membership of NEMA for the next ten years, if they go after it.

And all this is in manufactured products the bulk of which would or could be bought and installed by con-

tractors. They in turn would add a further labor charge, roughly equal to the cost of these materials. And there go your figures, sky high and over the fence.

It makes too many ciphers to juggle with. I say it. You say it. We all say it. And frankly, that's what's the matter with us. These markets sound so big everybody is afraid to tackle them. But that's all wrong. For nobody has to tackle the whole market—but only his part.

Twenty years ago or so, an old man of eighty odd years announced that he was going to walk from New York to San Francisco in 90 days. His name was Edmund Payson Weston. He had been an athlete in his day.

The *New York Times* financed his junket and made whoopee over it. But everybody said he was nuts. An old guy like that just couldn't walk across this continent. It stirred up no end of talk.

Well, he did it. It was easy. The reason was that Weston planned to just walk some thirty miles or so a day—and keep it up. But all the critics were thinking of walking 3000 miles.

It is the same way when we think of this market of ours. We are dazzled with the national figures. We forget that the work will all be done in towns

and cities in the smaller local volumes that can be handled.

There are 245,000 manufacturing concerns in America. Their factories need electrical modernization to the tune of \$300,000,000 a year for electrical materials and equipment. Too much to sell? Only when you think about this national total. For in your town it may be just a matter of 100 or 500 factories. You can sell a lot of them.

Likewise, there are many hundred thousand commercial buildings in the USA—many office structures, stores, theaters, hotels, warehouses and public institutions. Nobody knows just how many there are, but this number staggers the imagination too. Break it down to terms of any one community, however, and it's a market any contractor can work on and profitably.

Again, there are some part of 20,000,000 homes to be rewired. It must be done. It can't wait much longer. Impossible? No, because it merely means that in a city of 250,000 there will be 50,000 houses to rewire. And that will be done handily some day by mass production methods.

The contractors in each city, I believe, will eventually organize a special Re-wiring Company to take on the work, using standardized materials, tools and methods, unit crews served by rolling shops and salesmen, who take advance contracts on easy payments. The work will start say two months after the contract is signed to keep a large volume of orders in reserve.

To do this job will take the financial, engineering, organization and equipment resources of the large electrical contractors as well as all the smaller contractors now engaged in residential work. The power company will support the campaign with promotion. Behind this selling, there will be more house wiring for everybody.

And these things, I believe, are going to happen not some day but soon. They can begin to happen very profitably for all of us this year.

So when I look forward to this 1940 of ours I feel a great enthusiasm. General business is better in a big way—you know—steel, automobiles, lumber, cotton, wheat. Electric power output stands at an all time high. The war—thank God!—is staying away from our door and not bringing us an inflated boom. But it is starting to send us business in stimulating volume. And we electrical men sit in the middle of things, with the most modern of industries and markets all about us. Look at them—

**1. Factory buildings everywhere need modernizing**—And if we go to them with instruments, survey their electrical systems and show up wrong load conditions, voltage drop, bad power factor and other ills, we can offer them new savings and efficiencies that will build profits. The business is ours when we go after it.

**2. Commercial buildings everywhere need more capacity**—And with the new thin wall insulation conductors we can now pull out the old wires, pull in the new and find a good job in almost any of these structures.

**3. Residential buildings everywhere need more capacity**—And apartment houses and large homes can now be re-wired economically with thin insulation conductors, without disturbing the old conduits. And perhaps, 10,000,000 dwelling houses can be rewired as soon as we organize to sell the idea and do the work on a mass production basis.

Prosperity is staring us in the face! All we need do is step out with courage, purpose, imagination, and some hard work and it is ours.

Troubles?

Of course, some things are wrong. It has always been so. It always will be. Life isn't easy. And if it was we wouldn't like it. But half the troubles that beset us in this electrical contracting business of ours can be corrected or very much improved, if we will take them, one by one, and do what is needed. For example—

**1. We need statewide inspection**—We can get it. Rural inspection is already established on all REA projects, where the government has loaned money and wants to know that wiring is safe. A committee of contractors should visit the top man of the power system in every area and get him to establish inspection in their rural territory too. Get a state law, to protect the public safety.

**2. We need statewide licensing of electrical contractors and journeymen**—Men who do electrical work should be compelled to prove that they are competent and responsible. The law and the system should be fair, honest and patient. It should safeguard the property owner whose buildings are wired and the electrical contractor who is abiding by the law. It should bar out incompetent workmen. It should put more mechanics, who now do wiring jobs on a days work basis, living hand to mouth, back on the pay roll of an established contractor who can supervise and guarantee their work.

**3. We need better estimating standards in our business**—Competition between contractors has become too much a process of destroying the adequacy of jobs by price cutting. The chief cause is lack of cost knowledge. This is due largely to the secrecy that surrounds the estimating technique.

But estimating should be taught to everybody in the business. Even the journeymen should know about it. For it is the man who does not realize what expense goes into a job, who is the enemy of profits. So we need estimating schools in every city, in every shop, based on the NECA Manual, supported by accumulated local experience.

**4. We need better accounting standards in our business**—Many contractors fail to know their costs and estimate properly, because their accounting system is bad. Let's teach accounting locally also, with schools for contractors and their bookkeepers based on the NECA Accounting System. For here the technique is proven, easy and ready.

**5. We need better teamwork with labor in most communities**—Labor is as eager to avoid strikes as management, because the men have families to feed. Contractors benefit when there is better feeling in the shop and on the job, a clearer appreciation that steady work at good wages depends on profits to the boss, that will pay overhead plus a good margin for building more business, getting more jobs. Labor troubles can be improved by contractors who will give the matter a bit more care in their own organization and as members of the local industry.

**6. We need more teamwork in our own industry**—Confidence and cooperation among electrical men is at a low ebb right now. Many manufacturers and wholesalers extend credit to anybody who will do wiring and too often cut the price and maybe figure the job for him. Everybody loses, because the job is skimmed, and the man who does the wiring usually makes no money.

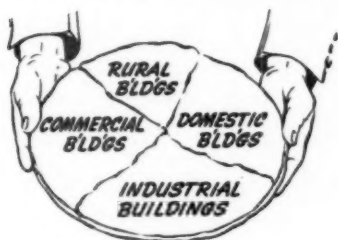
This and the abuse of protection orders by both the contractor and manufacturer must be curbed. The time has come to organize the indignation of the contractor against this suicidal system. It calls for straight talk, for self discipline and courageous police work by local associations. It can be legal. It can be effective.

But there is a lot more than trouble in this picture. The biggest problem of all is how to deal with all the opportunity, all that should be done, all these new markets. For example —





## Here's Your Pie! Take What You Want.



—Sign work, signal work, radio antennae work has slipped away from us. Why not get it back?

—Range and water heater wiring offers broad possibilities wherever the local contractors and the power company want to work together on the selling and installing.

—Attic fan wiring waits not only in the south but in any town, where there is a period of severe heat each summer. Here is one of the largest untapped markets we have—to sell these fans and put them in.

—Electronic control is ready, just edging into public attention. Yet there are innumerable applications in industrial, commercial and residential buildings waiting to be sold.

—Telephone raceways are becoming standard in many areas and can be made part of many house wiring jobs.

—Highway safety lighting is forging ahead and the contractor can install it, if he wants to.

—Rural wiring is growing in volume and improving in its quality. It will become larger and more important in our business. And there are many sides to it. Who will repair and modernize the inadequate and sloppy house wiring that has been installed in tens of thousands of rural houses? Who will service this farm equipment through the years? We should.

—The relationship between the industrial electrical contractor, the motor repair shop and the factory maintenance staff is approaching a very definite change. Management is discovering that to make maintenance efficient, maintenance men should be focused close on inspections, adjustments and small repairs, done on a fast regular schedule that anticipates trouble and prevents it.

Wiring extensions and alterations and repairs to motors, controllers and transformers will be more and more cared for by a contractor and motor shop that stand by as a reserve force to handle trouble. This relieves the plant staff from responsibility and expense. For the contractor and motor shop are ready with tools, labor and a

broader experience in selective purchasing and in supervision. There is a vast opportunity here.

This, of course, is but a partial list. I could continue setting down these markets and these opportunities. But you know what and where they are. In a way, it all sounds like a gigantic selling job—and it is if you will think of selling in its broad sense.

For selling means more than just going around asking for orders. The most vital part of selling is the organizing of your business—having a plan, a policy, a program, a spirit and a purpose, that makes you see the market, want it, create it, develop it, hold it and make it pay.

But, as I have said, after all it is not too big to handle, this market of ours—this opportunity. For you only have to do one days work and one days thinking at a time. You only have to tackle that part of it that is there handy in your town. And you can—and should—specialize by selecting first the class of work that you can sell easiest or handle to the best profit or both.

So I say—"Welcome 1940! You are a great year—because you are ours!" Think what we can do through the new calendar! And now let's start.

# More Profits and Shorter Hours



By J. M. Pilmer

MODERNIZATION MINDED J. M. Pilmer, president of the Electrical Engineering Construction Co. of Des Moines, Iowa, heads a staff of nine experienced electrical engineers. Mr. Pilmer is also president of the National Industrial Service Association, national organization of motor shop men.

**I**N 1937 we were working a 49 hour week. Today our men work 40 hours, at the same weekly wage. Our prices are the same yet we are still making a profit.

That in a few words is the job we have been able to do through plant modernization, organization, increased production per man, and waste elimination. By the same technique, it may be possible in the future to further reduce the work week to 35 hours.

In some industries, a decrease in weekly hours with a corresponding increase in the hourly rate of pay is simply tacked on to the price of the finished product. In the rewinding shop, it is not as easy as that. Our competition comes from new and second-hand motor prices. And, when the cost of a rewind job approaches the cost of a new motor, our work drops off sharply.

Therefore, to reduce hours and increase hourly wages correspondingly, the motor shop cannot increase prices.

This motor shop had to reduce working time and make more money. They found the way, first by getting better equipment, second by improved shop discipline. This experience is now passed on to you.

It must make up the difference in increased production per man.

The competition, which limits our price, comes from the mass production industry. It is necessary therefore, for the motor shop to approximate the shop methods of a mass production industry. Basically the thing to do is to—

1. Modernize existing machinery.
2. Add new cost-cutting machines.
3. Arrange the shortest possible production path.
4. Eliminate waste time and motion.
5. Develop a new and faster shop procedure.
6. Increase the individual worker's speed.

Following this plan, we adopted individual motor drive for all shop machinery. Winding lathes were rebuilt to enable each operator to select the highest workable speed. A new coil spreader was installed. We purchased a new loop winder which can be safely operated much faster than our old one. A new tension device on all winding operations also permitted faster work of superior quality.

In the cleaning and stripping department a high pressure pump was installed. Now, the cleaning fluid can be forced through a hose nozzle to wash motor frame and parts. A burning oven was installed on the production line to burn old windings and speed up stripping. We are now contemplating the purchase of sand blast cleaning equipment to further improve the efficiency of this department.

All heavy equipment is handled on a mono-rail hoist. With this equipment any motor can be quickly dispatched to any part of the shop by one man. A rearrangement of shop machinery, now permits a smooth flow of work through the shop with the least possible waste

time in moving from one operation to another.

These changes of equipment cost a tidy sum, also, interest and depreciation must be charged against the cost of rewinding. But, the results have shown that good equipment is a sound investment. It has effectively cut working time.

The next step was the elimination of waste time and motion. This must be largely accomplished through improved shop discipline. But our primary purpose, throughout this change, was to reduce the number of hours of work, and our men were 100 per cent for the program. For if the exercise of more rigid discipline would shorten the day's labor, the men themselves would be the first to profit.

The following rules were adopted:

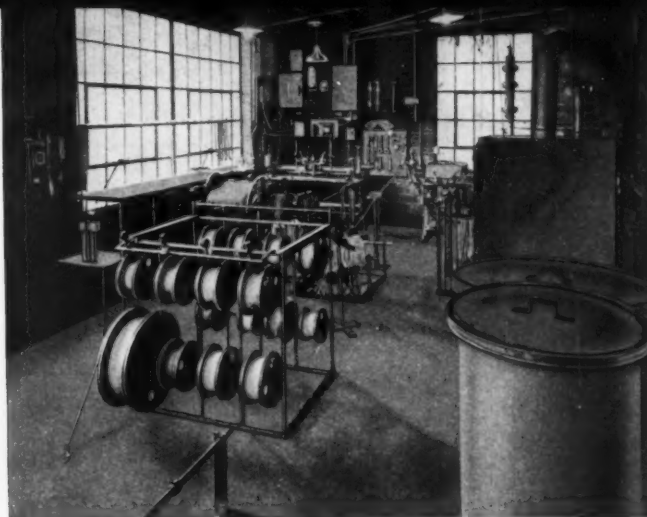
1. Start work on time. Eliminate the lag at the starting hour and before quitting time.
2. Handle all operations in a standing position. This eliminates the time required

TRANSFORMER WINDING gives a significant comparison between new and old equipment. The modern coil winder at left makes better coils faster than the old lathe winding at right.





SMALL MOTORS are handled in a separate department immediately adjoining customers' space. All small motor service work, including a complete stock of parts, is concentrated in one shop.



COIL MAKING department concentrates winders, stretchers, forming machines, dipping tanks, bake ovens and wire reel rack for fast production and economical handling.

for getting up and sitting down and adjusting the chair. Benches were raised to the most convenient height for efficient and easy work. Running the taping machine is the only operation we have in our shop which is best done seated.

3. Tools must be laid out in an orderly arrangement. Each man has a tool table where he can automatically reach for them. This saves the time necessary to search through a pile of tools or a box for an instrument that ought to be right at hand.

4. Each employee must maintain a good set of hand tools of his own. This eliminates the time required to borrow the necessary tools from other employees. This applies also to company tools, and the superintendent has the responsibility of properly maintaining and replacing shop owned tools. All tools are inspected once each week by the superintendent.

5. Shop must be kept clean at all times. The time required to walk around a pile of trash or side-step a grease spot is waste. A clean and orderly shop with all walk-ways clear materially helps production. The same thing is true of work benches.

6. No unnecessary conversation during the working period.

7. Smoking is not permitted during working hours.

To find these new and faster methods, we sent some of our key men on 3,000 miles of travel covering six cities. They visited about 15 motor repair shops. Each man was on the alert for new ways to do things better and quicker, because anything that cuts the shop time on a job cuts the man's time and ultimately increases his hourly rate.

To apply these methods and increase the speed of the individual workers required a gradual educational program. By installing variable speed drives on winding machines, the men were urged to try faster and faster speeds. In machine operations, the machine is doing all the work. Higher speed requires a readjustment of skill rather than the expenditure of more physical energy. And it is interesting to note here that the oldest man in our shop, a highly skilled machinist, adapted himself to higher speed work more quickly than our younger men.

Wage rates were adjusted according to the following schedule—

Wage Scales			
Original hourly rate on 49 1/4 hr.	Earning Per Week	Present hourly rate on 40 hr.	Earning Per week
.50	24.75	.60	24.00
.55	27.25	.70	28.00
.60	29.70	.75	30.00
.65	32.20	.80	32.00
.70	34.65	.85	34.00
.75	37.10	.95	38.00
.80	39.60	1.00	40.00

Overtime rates on the basis of time and one-half were readjusted to fit the 40 hr. week. Some employees work Saturdays, but these employees do not work Mondays, thus each man works on the basis of a five day week. Actually all get more overtime under the new plan.

A plan like this takes good organization, an intelligent and capable group of men, and then—eternal vigilance to keep the gains accomplished. Once these gains are established, a further goal may be set up and plans made to approach the new problems.

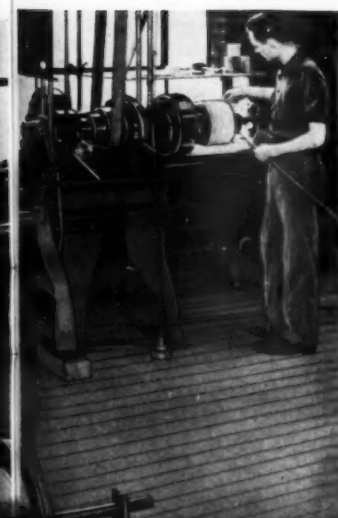
Out of this experience we have learned some things. They may be of interest to others who may want to introduce such a program in their own shops. Here are three suggestions—

1. Install good machinery made for each purpose. We have made a number of attempts to adapt machines for production work and to construct "homemade" gadgets. But, they do not pan out. In fact, it often costs more to adapt a machine to a production process, such as winding transformer coils, than to buy a new machine, specially designed for that work.

2. Many of our traditional shop practices grew up in industries concerned with entirely different problems than those encountered in the modern motor shop. The traditional way to do things is not always the best.

3. Any plan of shop discipline must be regularly and continually enforced. Permit frequent exceptions and the exceptions are likely to become the rule.

MACHINE SHOP tools are individually motorized. Cutting beads, blades and drills are inspected weekly. Mono-rail hoists provide transportation for heavy items to any department with small effort.





# Safety Ideas in Distillery Wiring



**REMOTE STARTERS**—Isolated from distillery fumes, in a ventilated room, these magnetic starters are operated from push button stations in the still building.



**PORTHOLE LIGHTING**—Projecting through rear-of-panel ports, these lights aid in checking the measurement of liquor where it leaves the still house.



**TANK FLOODS**—Cleaning and inspection of large kettles like this drop tub was facilitated by built-in port projectors. Flexible explosion-proof connections simplify maintenance.

**T**HE new still and dryer buildings recently erected by The Calvert Distilling Co., at Relay, Maryland, employ the most modern facilities for precision and hazard prevention in making rye, bourbon and gin. Electrical equipment is, of course, indispensable in the many production, control and handling processes involved in the complex problems of modern distilling. The predominant features of the electrical work are explosion-proof equipment and wiring, coupled with novel methods for

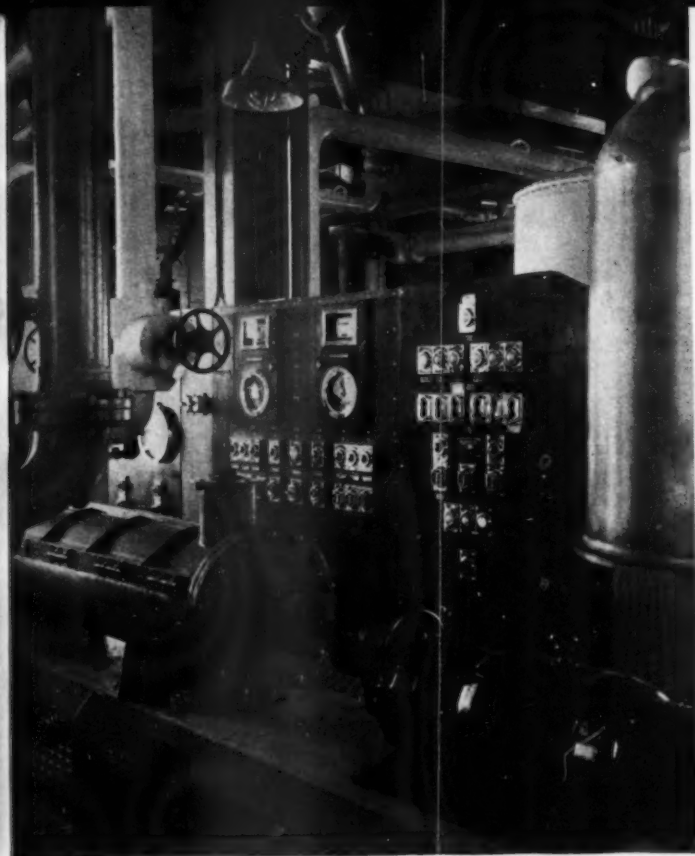
step saving and protective control.

The wiring was installed by R. J. Hefferman of Louisville, Kentucky, an electrical contractor who specializes in distillery installations. The layout provides local push buttons for starting all manually controlled motors. Float or pressure switch actuating devices abound for numerous automatically controlled motor drives, such as for pumps and compressors. In addition, the sequence handling of grains and mash in the weighing and blending operations

is controlled by electrical interlocks to prevent jamming or clogging. In the Calvert plant, motors cannot be started out of sequence or order of process flow. Likewise the stoppage of motors in any such line causes related motor drives to stop.

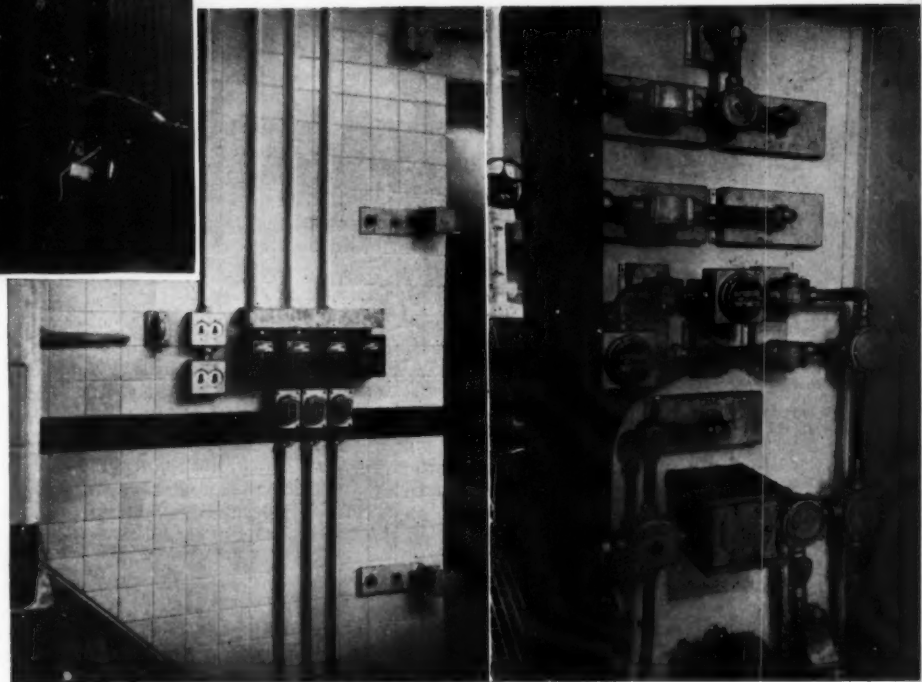
The explosive fumes encountered in the distillery require equipment and wiring to be of the Class I explosion proof type. So in this plant all motor controllers are isolated in rooms that are ventilated to the outside air. Only





## Control methods ingeniously installed to reduce hazards in a new distilling plant

**DISTILLERY CONTROL**—Fume laden explosive atmospheres require extreme safety measures for motors and controls. This 3-section central control panel is the nerve center for a maze of integrated motorized processes.



**CONTROL STATIONS**—Grouped buttons in non hazardous locations for controlling lights, ventilating fans and other motors save many steps for plant workers.

**FLUSH DEVICES**—Rear compartment of one central control panel section for conveyors. Flush devices were rear-connected and sealed to prevent sparks in fume-laden atmospheres.

the remote control buttons are to be seen at various starting or control stations in the still and dryer buildings. Thus, by grouping controllers in non-hazardous areas, the standard enclosure type could be safely employed.

With push button control employed throughout, these starting stations could also be located for greater convenience to the operators. And additional stations are employed wherever found necessary for more efficient operation. This is a distinct advantage, for the

still building has 54 motors totalling over 500 hp., and running from  $\frac{1}{2}$  to 60 hp. in size. In the drier building, there are 33 motors totalling 149 hp. All are operated at 440 volts, on 3 phase circuits.

The nerve center of conveying, weighing and the making up of batches in the initial distilling processes was grouped in an explosion-proof control panel, which comprises three sections. Here control stations, pilots, transfer switches and recording instruments pro-

vide complete supervision of many scattered operations from a central point.

To supplement the motor control facilities, local explosion proof lighting applications speed up inspection in tanks at gauges and liquor flow lines. All in all, modern design and arrangement of equipment is the outstanding feature in this plant. Of course, the wiring had to be worked out to suit each special need. It was all done with safety and convenience in production control as the chief objective.

# Saw Mill Motor

What a plant electrical staff does in the great lumber industry of the Northwest

By E. P. BEMIS.

Plant Electrician, Eastern and Western Lumber Co., Portland, Ore.

But a mill cannot be laid out in one straight line, and there are also various classes of materials to be separated. So, after the cant has passed the gang saw, which is first in line, it is picked up off the rolls by transfer chains traveling at right angles to the rolls. These chains are simply lifted up by their carriers from where they are idling between rolls, and hustle the cant off sidewise and deliver it in front of the next machine. The general principle is: forward endwise on rolls and laterally on chains.

In this mill, the gang saw comes first, followed by the trimmers. Then to sorting chains, where the lumber is marked and graded; then to the re-saw, from which it is pulled off to the carriers which pile it out in the yards. This is for the "green line" after the gang. Certain other materials from the gang are sent instead to the dry kilns, out



E. P. BEMIS, at home

SMALL Rip band saw working in the re-saw mill. A 25 h.p. motor drives it.

**M**AINTENANCE of motors and motor control equipment in a large saw mill requires frequent and close inspection. We must anticipate trouble before it is far enough along to shut down any section of the mill. We have 144 motors in operation, all General Electric, from two hp. up to 400 hp. The majority are of the squirrel cage type, with some slip-ring induction motors. The largest are provided with magnetic remote control, others with drum control, and the balance with hand-starting equipment. The bulk of the power application is by belt drive, with rope drive and direct connection represented.

The fundamental steps in our operation, requiring the application of motor power, are these: First, the logs are drawn up the log haul incline to the second story of the mill, by massive linked chains provided with dogs. They come first to the head rig, where they meet a 10-ft. main band saw, followed by a 9-ft. pony band. These dimensions are the diameters of the wheels on which the saws run.

As the slabs or cants come off the log, they fall onto a long line of revolving rollers, called the roll case, which carry the cants head on into the mill.

of which they eventually go to planing mills, for planed finish lumber and planed dry common.

In the meantime, all along the lines, waste has been coming off and passing along other lines of travel. Some of it

## SOME OF THE PRINCIPAL MOTORS IN THIS MILL

APPLICATION	HP	RPM	
1 Head rig, main band saw.....	300	600	Slip ring, three bearing
1 Head rig, Pony band saw.....	300	600	Slip ring, three bearing
1 Edger .....	400	1200	Squirrel cage
1 Gang saw .....	250	600	Slip ring
1 Edger feed .....	15	400-1200	Squirrel cage, double wound
2 Trimmer feed .....	10	400-1200	Squirrel cage, double wound
7 Conveyors .....	15	720	Slip ring
2 Vertical re-saws .....	100	720	Slip ring
1 Canting gear .....	20	900	Slip ring, remote control
1 Pony log haul .....	15	700	Squirrel cage
1 Main log haul .....	75	900	Squirrel cage
1 Hog fuel machines .....	150	900	Slip ring, drum control
1 Second section roll case .....	15	900	Slip ring, drum control
1 First section roll case .....	40	900	Slip ring, drum control
1 Set work .....	15	900	Squirrel cage, for rope drive
1 Set work, Pony .....	10	1200	Squirrel cage, for rope drive
1 Cut-off saw for big side .....	30	900	Squirrel cage
2 Cut-off saw for big side .....	15	900	Squirrel cage
1 Cut-off saw for Pony side .....	10	900	Squirrel cage
1 Slasher .....	40	400	Squirrel cage, direct connected
1 Trimmer .....	75	720	Squirrel cage, direct connected
1 Roll case .....	25	900	Squirrel cage
1 Saw converting slab to fuel .....	40	900	Squirrel cage
1 Rolls to green chains .....	15	1200	Squirrel cage, reduction geared
1 Small trimmer .....	50	720	Squirrel cage, direct connected
1 Lath mill .....	20	900	Squirrel cage
1 Rolls after gang .....	20	900	Squirrel cage
1 Timber planer .....	100	900	Squirrel cage
1 Green planer .....	100	1200	Squirrel cage, direct connected
1 Double planer .....	75	900	Squirrel cage
5 Dry planers .....	75	1200	Squirrel cage, direct connected
1 Planer .....	75	1200	Squirrel cage
1 Moulder .....	40	900	Squirrel cage
1 Double blower .....	100	720	Squirrel cage
1 Single blower .....	25	900	Squirrel cage
1 Rotary pump .....	40	900	Squirrel cage
1 Band saw, planer shed .....	40	720	Squirrel cage
1 Band Rip saw .....	25	720	Squirrel cage

# Maintenance



**HEAD RIG**—Where a 20 h.p. squirrel cage motor drives the canting gear that cants the logs over onto the saw carriage.

is worked up into lath, some into fuel lengths. Some is ground up in "hogs" to make fuel. Then, of course, there is the sawdust itself, passing into a dust collector system to be eventually fed to the boiler furnaces. We have our own steam power plant, operating a 2500 kw. turbo generator, delivering current at 450-volts. All motors are 440-volt.

Dust is a constant trouble to contend with in a saw mill, despite elaborate blower systems. To keep the motors as clean as possible is the first rule. If there is any question as to temperature, get the instruments and check for overload. Perhaps it is a sticking belt. Whatever it is, run it down right now and apply the remedy. The rounds

must be made over and over every day. Every time an overload device functions it means slowing up the operation of the mill.

But these overload devices will function in spite of all precautionary methods. Then it is necessary to get there quickly and apply the remedy, to save as much man-time as possible. Therefore, it is necessary to know intimately the peculiarities of every motor application. For instance, we have one hoist that is always operating under excessive loads. As soon as I get my signal and learn that there is trouble there, I am pretty sure that it is a blown fuse and go at once to the board and test before proceeding farther. If an edger feed motor stops, again I know

that it would be a fuse. Somebody has gone from forward to reverse without bringing the motor to a dead stop.

In caring for motors in the midst of dust, they are blown out with air once a week. Two oilers are put on this work on Saturday. This is a matter of routine and it is never slighted. These men also see that all bearings are oiled at the same time. There are four or five other things to watch for in connection with the various types of motors—

**1** Watch the motor leads in the junction box. The constant vibration in the mill and the tremendous bumps around the log haul and head rig, when a big fir log is being led to the slaughter, will finally break the insulation at this point if the leads are not kept in good order. If the insulation does begin to break down, the 440-volt current can get to ground mighty fast.

**2** In slip ring type motors, watch for anything that can cause shorts between the pig tails of the brushes. Pieces of bark and splinters of wood will sometimes get in where they can work around and push the conductors together, causing a short and blowing a fuse.

**3** Water may get into a squirrel cage motor, as from an opened sprinkler head. I know the general plan in such a case is to get the motor to the shop, tear it down, put the heat on it and dry it out before it is put back on the line. But I don't do that. I put the air on it where it stands to help dry it out, but otherwise let Nature take her course. Keep it running and it will eventually dry itself out and be as good as ever.

**4** Periodic overhaul, cleaning and painting are also good insurance against motor

(Continued on page 72)

**MAIN BAND SAW MOTOR**—A 300 h.p. three-bearing slip ring induction machine. The saw is on the floor above.

**GRINDING the big band saw on an automatic "filing machine".** A 15 h.p. motor supplies the power for this and several other jobs.



# When You Install Temperature Controls

**T**EMPERATURE control usually involves two wiring systems, (a) 110 or 220-volt line circuits and (b) low voltage control circuits which normally operate at a potential of 20 to 24 volts. The control current flow is generally an ampere or less.

Most control wiring falls under article 8003 of the 1937 code, class 2, type 2 wiring (15-30 volts, 3 amperes). In a few instances, where current is not limited to three amperes, the control wiring must be made in accordance with article 8006 for class 3 systems, but this is very rare.

While conduit or other raceways are frequently employed for low voltage conductors, the following conductor assemblies are also used and run exposed—

#### A. Plain thermostat cable.

Double cotton wrapped, No. 18 multi-conductor color-coded, with parafined cotton braid over all.

#### B. Armored thermostat cable.

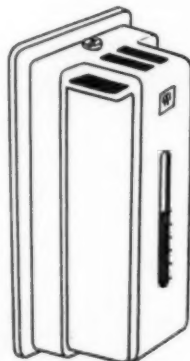
Similar to plain thermostat cable, with a metal braid armor.

#### C. Armored rubber covered thermostat cable.

Number 18 conductors with a rubber covering, color-coded, dipped braid over each wire, over all metal braid.

Wires pulled in raceways may be No. 18, standard type R, color coded, single-conductor. However, a cable similar to type C above, but without armor, is very satisfactory for conduit work. Since the wires are twisted together and color coded, identification is easy after the wires have been pulled. If several 5-conductor cables are pulled in one conduit, it is necessary to ring out only one wire in each cable to identify the group. When one 3- and one 5-conductor cable are pulled in together, they may be readily identified without ringing.

In domestic installations the low voltage wiring is generally run exposed where the local code permits. This wiring is usually in dry locations and type



Discussing practical methods for installing and connecting temperature control equipment. Out of a wide experience as a field engineer for Minneapolis Honeywell, James Locke tells how to handle this apparatus and what to look out for.

**By James S. Locke**

*Minneapolis Honeywell Regulator Co.*

A, plain thermostat cable may be used. However, any of the types A, B or C are satisfactory.

When running exposed wiring for commercial or residential air conditioning installations, armored rubber covered thermostat cable (type C) should be used. It may be necessary to wire in damp places and where there is possibility of mechanical damage to the wires.

#### Precautions in Controlled Wiring

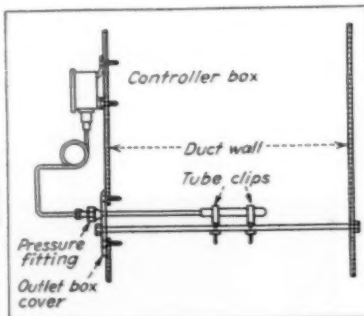
1. *Be Sure to Use Color Coded Wire*  
Safety is the best policy. All too

often, when an installation is completed, the thermostat in the president's office is wired to control the temperature in the ladies rest room and vice versa—which is distracting to everyone. Color coding eliminates such situations.

#### 2. In extending Cables—Splice Like Colors Together

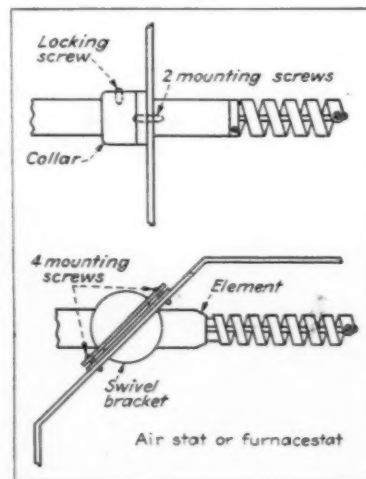
Wires may check out at both ends, but if the middle has been put in the mixing machine trouble results.

#### 3. Never Use Larger Than No. 18 Wire Unless To Meet Code or Load Requirements



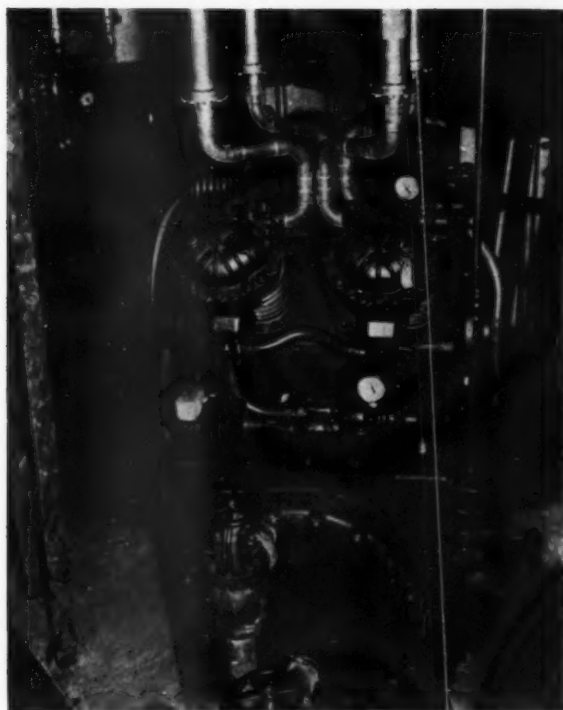
INSERTION THERMOSTATS should extend well into the air stream. A length of tubing provides solid support.

RIGID AND UNIVERSAL brackets permit solid fastening before the temperature element is inserted into the air stream.



*Electrical Contracting, January 1940*





DELICATE DEVICES provide automatic control for this battery of eight compressors in a Ft. Wayne, Ind. department store wired by the Dix Kelly Electric Co.

MODULATOR DEVICE which selects and operates the air conditioning compressors to maintain comfortable temperatures at all points at all times.



The terminals on low voltage controls are designed for No. 18 wire and larger wires are difficult to connect.

#### 4. Do Not Run Line Voltage in Low Voltage Conduit

This is contrary to code regulations. 110 volts is unhealthy for low voltage motors and relays.

#### 5. When Fastening Exposed Wires Use Insulated Staples

Un-insulated staples may cut through the insulation and cause short circuits.

#### 6. Follow The Wiring Diagrams

Diagrams furnished with controls are for wiring, not to provide torches or cleaning material. Hooking up controls without a wiring diagram is like hunting for buried treasure without a map.

Most control manufacturers pack complete mounting and adjustment instructions with each instrument. These should be used. Do not throw them away. They contain valuable information.

#### 7. Room Thermostats

Most room type thermostats and humidity controls are furnished with mounting plates for surface mounting on the wall. Adapter plates are available for mounting on switch boxes. Read the instructions packed with the

instrument. Thermostats should be located in the path of normal air circulation and about five feet from the floor.

Do not place a thermostat where hot or cold water pipes may be in the wall behind it, nor on an outside wall, or in the path of air from a warm air register.

Before mounting a thermostat, stuff soft wadding or tissue paper in the hole or outlet box behind the instrument. This will prevent air in the wall from affecting the instrument.

#### 8. Duct or Insertion Controllers

The general types of duct controllers are (a) Bimetallic—Rigid Element, and (b) Vapor Tension—Remote Bulb.

When mounting either type be sure that the instrument case is accessible and so placed that the setting scale may be used. Connect the first run of conduit or steel tube to the instrument with a short length of flexible conduit. This prevents any strain or distortion of the instrument and also minimizes vibration effects.

Removable mounting brackets are provided which are independently fastened to the duct, after which the end of the thermostatic element is inserted, and made secure. With universal brackets the instrument may be mounted on incised ducts and the case still kept level.

#### 9. Remote Control

The remote-bulb vapor-tension type of controller is perhaps more frequently met with in air conditioning installations. This instrument consists basically of a head or case containing the control housing and actuating bellows, which is connected by means of small flexible copper tubing to a temperature sensitive bulb.

#### 10. Excess Tubing

When tubing exceeds the length needed, leave it coiled exactly as it comes from the factory. This avoids unnecessary bending of the tubing and affords a more presentable appearance than can usually be obtained by reforming the tubing in the field.

The mounting of other types of control apparatus, requiring no direct mechanical attachment to the equipment controlled, generally offers no serious problem. Care must be taken with instruments, using mercury tubes or gravity opening relays, to make sure that the apparatus is level. Easy accessibility is another desirable feature.

Temperature control devices are precision instruments but ruggedly made. Installation data and connection diagram are always packed with the instruments. With reasonable care in handling and connecting there is no reason why a control job should be difficult or complex.



**DAYTIME CONTRAST** — Small wall areas as well as large spaces all are lighted with tubing from overhead canopies. Fluorescent lamps are kept on throughout the day.

**FLOOR CASES**—Each 15-ft. case employs five 36-inch, 30-watt tubes in a continuous reflector. Daylight illumination floods both sides of the card rack.



# Daylight Tubes in Display Lighting . . .

How a new gift shop employs fluorescent lighting to step up sales.

**T**HE effectiveness of modern display lighting for emphasizing colorful merchandise stands out in the new quarters of the Helen Coombs Shoppe, Inc. This store occupies a prominent corner space in a recently completed office building in Wilmington, Del.

Using daylight fluorescent tubes, it required but 750 watts to light display cases and shelves all over this store in a most effective manner. The installation, as made by the Wilmington office of Hatzel & Buehler, Inc., provides a good example of how this new lighting technique lends itself to commercial purposes.

From the customer point of view, this use of daylight lamps is most interesting, because it reveals colored gifts at

their best. Racks of high grade cards are displayed in a colorful array for those who seek an appropriate birthday or anniversary greeting. In the end this subtle presentation of merchandise through true color appeal, is proving itself to be smart selling.

The lighting equipment is relatively simple in design, though applied carefully to harmonize with this store's fixture layout. Where cards are displayed at two long floor cases, these have full-length reflectors from which a continuous flood of daylight illumination projects downward. It does not shine in the shoppers' eyes.

Wall displays of varying lengths and shapes employ canopies overhead in which daylight fluorescent tubes are

placed for projecting light downward and slightly outward. Thus every group of merchandise in the store is treated with a flood of color-accentuating illumination. The appeal is immediately evident, as confirmed for the management by customers who came in to look and buy. Fluorescent has come to town, and this new gift shop's displays are the talk of Wilmington.

The accompanying photos show how it was done. Because there is nothing complicated in lighting similar displays for other merchants, this new installation points the way to a new type of business for the contractor. Where there are colors to be displayed, sell fluorescent display illumination for better merchandising.

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**WHERE ARE  
THOSE FUSES!**



**WON'T  
YOU CHANGE IT  
FOR 25¢ A YEAR?**

When lights blink out, do you still hunt high and low for those new fuses you forgot to buy, stumble down dark cellar stairs, gingerly fumble around in an old-fashioned fuse box wondering what to do? It's so much better and simpler to have your home protected electrically by a modern Cutler-Hammer Multi-Breaker . . . so you merely step to the kitchen wall, reset a little lever that has snapped out of position and without fuss and bother you, yourself, restore the electric service in a twinkling.

This modern convenience built into the average new home adds less than \$5.00 to its total cost . . . about 25c a year on the usual home financing payments! Or you can have a C-H Multi-Breaker installed in your present home for surprisingly little. Ask your local electrician or electric light company for an estimate. Be sure you get the genuine Cutler-Hammer Multi-Breaker. CUTLER-HAMMER, Inc., Pioneer Electrical Manufacturers, 1306 St. Paul Avenue, Milwaukee, Wisconsin.



Now is the time to feature CUTLER-HAMMER Multi-Breakers  
Nationally Advertised to get you MORE sales and MORE profits!

Make this **YOUR** Advertising





# Editorials

Earl Whitehorne, Editor

## Victory Enough!

The power companies have made a fine contribution to progress in securing the approval of thin wall insulation under the Code. Credit goes to them. They pushed it through.

But there has never been any question in our minds that it should be approved. Most electrical contractors have been for it, as witness our ballot by 1000 contractors last summer.

Bare neutral and CNX were not approved because the safety of these innovations has not been generally accepted. Also, they do not appear to offer advantages of any great importance, thin insulation being available, and they have been supported by too much opinion and too little fact.

We hope that the power companies will not permit their real disappointment over CNX and bare neutral to cloud the opportunity offered to them by the thinner wire. There will probably not be another Code revision for three years. We urge them, meanwhile, to forget what they have failed to win and concentrate on helping to turn this thinner wire into a great achievement, through the rewiring of all types of buildings now suffering from tight conduits.

## The Vote on CNX

In these pages last month, Frank Hodgkinson analyzed the balance of voting power in the NFPA Electrical Committee that rules our Code. He pointed out the community of interests between the power companies and the electrical manufacturers from whom they buy equipment and the fire insurance companies from whom they buy insurance—the natural influence of the big customer.

This shrewd observation was borne out in the contest over CNX last

month. The power companies, electrical manufacturers and stock insurance companies voted solid. Were it not that the five new members representing the United States Conference of Mayors were voting for the first time, CNX would have been approved. For it was thrown out by two votes.

We believe the contractors should have five more votes. We believe the Mayors Conference should have two more votes.

## Inspectors Should Meet

We've said it before. We'll say it some more. There is a weak spot in our inspection system that concerns the electrical industry deeply. There is too much divergence in Code interpretation.

There is only one cure—to give inspectors more opportunity to meet together and think together. Occasional evening meetings in the larger cities do not give time enough. Full day monthly regional meetings would be very profitable.

Inspectors must agree among themselves before we can hope to see others conform. And agreement comes only through discussion.

## Control of Raceways?

Contractors are troubled over the vote of the Electrical Committee, approving the use of the space within steel cellular floors as raceways for electric wiring. For the first time, control over the raceways of the electrical system is permitted to pass out of the hands of electrical people.

If space in steel flooring is to be used, they ask, why not also the space in tiling of various kinds? And if

burr-proof interior enameling of raceways is as important as we have always believed it to be, how can we protect bare insulation in pulling wires through such structural spaces that have been installed by other trades? These are hard questions.

The fact that this subject came before the committee late at night and did not appear on the preprint, was unfortunate. NEMA members opposed it. Other members appeared unprepared.

Cellular floor products now on the market may be entirely safe. But a quick vote that involves so vital a matter as the right of the electrical contractor and the electrical inspector to control the raceways used by wires, may lead to serious trouble later on.

## Just Like People

Some contractors and motor shops think it is smart to let their workmen know what time has been estimated on a job. They believe it stimulates them to beat the time and show how good they are. Other employers fear that it encourages the gang to loaf. Ho-hum! Doesn't it all get back to your relationship with your men?

If they don't give a damn, some of 'em will soldier. But if they like you—because you make 'em feel that way—you can count on cooperation and safely take them into your confidence.

## Federal Indictments

Indictments of electrical contractors in Pittsburgh, New Orleans and San Francisco are probably the first of the series that will come as Thurman Arnold's Federal crusade against the building industry unfolds. It leaves electrical men disturbed and confused.

The general impression appears to be that the Department of Justice is whipping up smoke for political purposes. And the department is already on record that there is no implication of moral turpitude in these general actions against men and local associations, in the course of this nationwide campaign. But an indictment is no compliment, no matter what Washington says. It does not help men who must continue operating in the building industry to go on with their business or to sleep better at night.

The worst of it is that no red and green lights have been set up.

*Electrical Contracting, January 1940*



Electrical contractors do not know what policies the government will approve and what it will condemn. There is no justice and no sense in it.

## More Pictures

Some electrical contractors take pictures of good installations, paste 'em in scrap books and use 'em in their selling. It is smart technique. For pictures prove what kind of work you do—how good you are—better than a lot of words.

Pictures cost money, of course, if each time you have to hire a commercial photographer to do the job. The better way is to buy a good camera outfit and have some member of your staff learn how to make good shots that tell the story. The saving will soon pay for the equipment. Also, it will produce more pictures and so help your selling.

## Buying Wastes

Wholesalers worry about the high cost of small orders. It costs at least a dollar and a half to handle one, they say, and that is often more than the charge. It's money wasted.

Well, how about the high cost of buying small orders? It's just the same. The time spent and the accounting cost means waste to the contractor also.

There is just one way to avoid it. Quit doing it. Cut out the sloppy buying. It pays to plan your purchasing.

## Cost of Inadequacy

A. B. Smedley, the well known cable engineer, says that a 5 per cent voltage drop means a 15 per cent loss in light. A 10 per cent drop on two 500 watt lamps, he says, costs \$34 a year. Often the line loss cost exceeds the entire power bill. One factory with 9 foot candles of light, for example, replaced 300 watt lamps with 500 watt units and due to increased line losses got only 8 foot candles intensity. An electric roaster operated unsatisfactorily because, in spite of 120 volts at the building entrance, that in the apartment was only 105 volts. One rewiring job, he knows of, paid for itself every 24 hours.

Many plant men and contractors are

unaware of the actual cost of inadequacy on old electrical systems. But these facts backed by the right meters will sell management on the value of system check-ups, plant surveys, and making wiring adequate. And the man who has uncovered bad conditions will be asked to remedy them.

## Back Talk

### It Helps

To the Editor—"I have been getting your magazine for over a year now, and have never written to tell you how much it has helped me. I am always keen to read of the latest development in the electrical business and believe me this book sure fills the bill. I have obtained some good ideas in pipe work and wiring.

"I am working at present for the electrical dept. of the City of Edmonton. It is good to study up on these latest developments, so when the boss asks you about something new in the electrical line you are able to answer him intelligently."

Joe Stenton  
Edmonton, Alberta

Thanks, Joe Stenton. It is good of you to say so.

### Re— Electrical Committee

To the Editor—"Your editorial in the November issue was tops. I certainly never realized before that out of 51 voting on the Electrical Committee, only two of them were contractors. It's about time something was done about it.

"I think we ought to go even one step further and have labor possibly represented. Because the day is coming when we will have to sell one another rather than pat the back looking for a spot to stick the knife in."

S. J. O'Brien, New York

To the Editor—"Until I read your November editorial I never realized that we had such little voting power on the Electrical Committee. By all means, the electrical contractor's experience should be made more effective. I hope that others will give their support in the furtherance of your suggestion."

Louis Freund, New York

To the Editor—"What is needed is a very definite urge upon the part of all those representing the public interest to get together, so that they may thoroughly understand their mutual problems. In that way, they will become an effective unit in producing in the National Electrical Code the type of rules which will serve the public."

W. J. Mahan, Electrical Inspector  
New Haven, Conn.

Because the Electrical Committee meets only every two or three years, too few contractors are familiar with its work. But it is vitally important to our business and we should have a better voting power. At present the related commercial interests are too strong a combination.

### That Dream

To the Editor—"Here's hoping that your dream entitled 'A Tip From Socrates' comes true. This sort of thinking, if you are in a position to get it to the proper people, will certainly do a lot to reduce the extremely high cost of operations today for both the distributor and the manufacturer.

"We agree with you in every respect."

Hoyt O. Smith  
Hardware & Supply Company  
Akron, Ohio

Thanks for your thoughtful letter. We are all so apt to consider that the present way of doing things is the only possible course, it seems worthwhile to toss out suggestions of this kind once in a while. Whether it comes true or not, of course, is something else.

### Comments on Purdue Cause

To the Editor—"At the Johns Hopkins University, we are not giving any course specifically leading towards electrical contracting. Quite a number of our men go into this field and I believe, from what they tell me, they enjoy the work and are doing well.

"I do not know of any other university outside of Purdue that is fitting directly for this field."

W. B. Kouwenhoven, Dean  
The Johns Hopkins University

To the Editor—"Concerning the Purdue course in electrical construction, for a number of years I have given a somewhat parallel course (though probably not as detailed) to senior architectural students. The course, called 'Electrical Equipment of Buildings,' includes illumination design, selection of motors for industrial use, wiring methods, code requirements, specifications, the basis of electric rates, and a brief study of the selection and operation of elevator equipment.

"The course is intended to enable the architect to handle the electric systems of buildings.

"Our electrical engineering students cover the same ground in more detail.

"I feel that they are well equipped to enter the electrical contracting field and I agree with you that there should be immediate opportunities for electrical engineers in this field."

Stanley B. Wittac  
Professor of Electrical Engineering  
Rensselaer Polytechnic Institute  
Troy, N. Y.

To the Editor—"Concerning the possibility of establishing a course in the electrical contracting business, I have felt as you have that more of our technically-trained men should be entering this field. May I suggest that cooperation with the electrical contractors in the placement of our under-graduates for summer work would be effective in achieving the ends desired.

"I shall be more than willing to cooperate with you."

Fred H. Pamphrey  
Professor of Electrical Engineering  
Rutgers University,  
New Brunswick, N. J.

To the Editor—"Concerning the course in electrical construction now being offered at Purdue, Stevens does not offer a specialized course in electrical engineering. I do not know of any other engineering college that is undertaking work of a similar character."

Frank C. Stockwell  
Dean of the Graduate School  
Stevens Institute of Technology,  
Hoboken

To the Editor—"Your article on the course in electrical contracting at Purdue is very interesting.

"I doubt if such a course is a necessary part of the curriculum at a university. After all, there are only four years in which to give the students a thorough grounding in fundamentals and as much contact with the humanities as possible. I feel that we had better confine our activities to doing the best possible job along those lines."

F. N. Tompkins, Associate Professor  
of Electrical Engineering  
Brown University, Providence

These comments, drawn from answers to an inquiry, sent to the electrical engineering schools of the country, indicate that the colleges so far are not offering much direct preparation for the electrical contracting business, as they are at Purdue. We still believe that it is important and worth stimulating in any way we can.

# WIRING Methods

## PANEL SUPPORTS FOR FLUSH MOUNTINGS

Angle and channel iron supports, for mounting flush type lighting and telephone cabinets, were used by the Garden Electric Company of Elizabeth, N. J., in an administration building they were wiring. They worked out well.

For panels located in partitions, 1½-in. or 1½-in. angle iron uprights were used. In some cases, these supports were spaced to accommodate the panel between them; in others, the panels were mounted on the face of the supports. To avoid drilling the steel beams, clamp type brackets were made to fasten the uprights to the beams.

Where panels on succeeding floors were mounted directly above each other, the uprights were extended about 12 inches above the beam over the panel. This permitted the attachment of angle iron extensions, to support the panel on the floor above, after the concrete was poured. By clamping the supports to the beams all conduit work could be completed before either floor



**PRE-CAST ANGLE** iron supports hold flush mounted panels in position while conduit work progresses. Arrows point to iron uprights. "A" shows attachment to support extended from floor below.



**BRACKET SUPPORT** of channel iron for flush mounted panels located in outside walls. Wood wedge or conduit nipples provide horizontal adjustment of cabinet. Brackets are removed after wall is built.

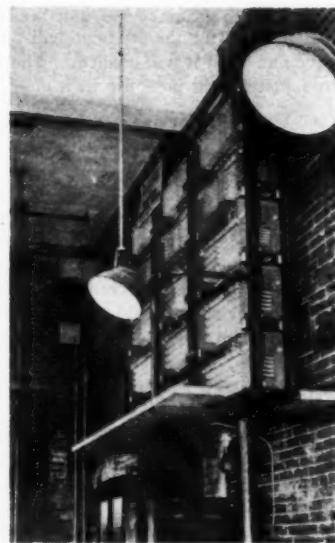
was poured. Mounting the panel between supports afforded an opportunity to make the necessary adjustments for flush mounting. The partitions were built around these uprights.

Where a panel was located in an outside wall, supporting brackets of 2-inch channel iron were used. These brackets were bent as shown in the photo and clamped to the column by four J bolts or pieces of flat iron and straight bolts. Four bolts held the panel to the brackets. Conduit spacers or wood wedges were inserted between the panel and the brackets to adjust for flush measurements. The brackets were removed after the wall was built around the panel.

## FLEXIBLE GRID RACK

Replacing resistor banks will be no problem at the San Diego Sun Press. The California Electric Works, Ltd., designed and installed a grid rack which permits the removal of any resistor bank without disturbing the rest of the group.

The assembly consists of two rectangular frames of 3-inch channel iron,



**FLEXIBLE RACK** for resistors designed to permit the removal of any one bank without disturbing the others.

which form a cage for supporting the grids. The top and bottom rows of grids are bolted to this frame. The intermediate groups are bolted to these two rows through conduit nipple spacers. By removing 8 bolts, any one resistor bank can be removed by itself and the others remain intact.

## SAFETY PRECAUTION

In the floodlighting installation at Shibe Park the Utilities Engineering Company took every precaution for the safety of the "fans". Wherever the



**CONCRETE ENCLOSURES** protect spectators from touching the 2300 volt feeder conduits at Shibe Park, Philadelphia.



# HAZARD BUILDING WIRE

marked for  
**TYPE, VOLTAGE, SIZE  
and INSULATION.**

0-----HAZARD - FIREKROME RH 600V-----12-----PERFORMITE-----

HAZARD PERFORMITE WIRE » » » super-adequate wire for all important jobs. Super-aging and heat-resisting. Smaller sized copper safely carries your load.

0-----HAZARD - FIREKROME RW 600V-----12-----WATERTITE - RW-----

HAZARD WATERTITE WIRE » » » for adequate wiring in moist places. Replaces lead encased cable. Approved by Underwriters Laboratory Section 3035 National Electric Code. Type "R.W." marked every few inches to insure identification by inspector.

0-----HAZARD - FIREKROME P 600V-----12-----30%-----

0-----HAZARD - FIREKROME R 600V-----12-----HAZACODE-----

HAZARD 30% BUILDING WIRE (Performance Grade) and HAZACODE (Code Grade) Adequate Wire » » » for all standard service jobs. Imprinted every 2 feet. Six standard colors. Meets requirements of the National Electric Code Standard.

Your jobber will supply all Hazard Building Wires.

## HAZARD INSULATED WIRE WORKS

DIVISION OF THE OKONITE CO  
WORKS, WILKES-BARRE, PENNSYLVANIA

New York Chicago Philadelphia Atlanta  
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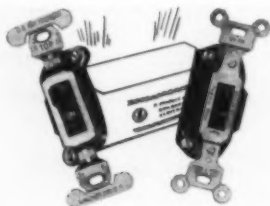


Pittsburgh Buffalo Boston Detroit Seattle  
San Francisco St. Louis Los Angeles

*Have you heard?*



## GENERAL ELECTRIC HAS A NEW SWITCH PACKAGE THAT'S A WOW



This sales-provoking switch package, GE3316, is a natural to help you in demonstrating and selling "First Line" quality switches both in your shop and on calls to customers.

Contained in the package are 50 G-E Standard Switches completely insulated with Textolite, Cat. No. GE2841; 15 G-E Sphinx Mercury Switches, Cat. No. GE3008 and an action display — all for the price of the devices. Powerful sales promotion material will be available.



*IT'LL HELP BUILD SALES*

The new G-E Standard Switches have blades securely anchored for permanent alignment. Large binding screws accommodate No. 12 wire. Wide mounting ears provide correct and easy installations. The G-E Sphinx Mercury Switches are durable and silent. There are no springs to break or blades to hammer away.

This display will arouse interest. It—but there isn't room here to tell all about this effective display or the sales promotion helps. Ask your nearest G-E Merchandise Distributor about the G-E Switch Package for bigger switch sales or write to Section D-0121, Appliance and Merchandise Department, General Electric Company, Bridgeport, Conn.

*THERE'S A FINE DISPLAY INCLUDED*



**GENERAL  ELECTRIC**

## WIRING *Methods*

[FROM PAGE 24]

high tension conduits were exposed to possible contact by the spectators, concrete enclosures were built to a height of about ten feet above the floor. Where conduits passed through floors, this was done, even when recessed in the channels of steel columns.

## CONDULET SUPPORT

One method of supporting fixture condulets is by using a conduit nipple spacer. In this installation a shield driven into the concrete ceiling re-



*NIPPLE SPACER gives a good appearance and solid support to fixture condulets.*

ceives a  $\frac{1}{4}$ -inch bolt rod. A  $\frac{1}{4}$ -inch or  $\frac{3}{8}$ -inch nipple is slipped over the rod and the conduit, with a mounting hole drilled in the back, is drawn up tight against it. In addition to giving a precast appearance, this nipple gives a solid support to the conduit.

## BRANDING IRONS

The W. V. Pangborne Company of Philadelphia sees to it that none of its equipment goes astray. Small branding irons with the name "PANGBORNE" are kept in the shop and on large jobs. These irons are designed to fit over the nozzle of an ordinary blow torch and can be heated by the torch blast. Any unidentified new equipment such as ladders, scaffolds, tool boxes, hammers, picks, shovels and similar items can be quickly marked immediately upon delivery to the job or shop.



RESOLVE NOW TO

# Double Customer Satisfaction

ON ALL 1940 LIGHTING JOBS!

## Specify... ART METAL FIXTURES...

### 1. THEY'RE BETTER TO SEE WITH!

Engineered on the one simple but all-important principle that "there must be enough light and it must come from the right direction", Art Metal Fixtures are also laboratory tested to see that they embody all three essentials of good light conditioning . . . adequate illumination, avoidance of glare, and avoidance of too great contrast between light and dark areas. So, when you give customers the advantage of Art Metal Fixtures you guarantee their complete satisfaction from the standpoint of correct light intensity and improved seeing conditions.

### 2. THEY'RE BETTER TO LOOK AT!

Also, when it comes to appearance, Art Metal Fixtures are equally certain to please your customers! For commercial installations, their simplicity of design and smart styling make them appear as business-like TO the eye as they actually are FOR it . . . and for the home, you'll find that Art Metal Fixtures have been skillfully designed to complement any interior decorative scheme. This means double the satisfaction with Art Metal on the job.

... AND THE ART METAL LINE  
IS COMPLETE FOR EVERY USE!

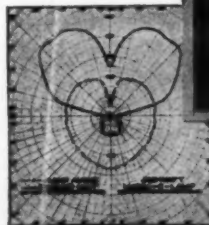
STORES • OFFICE BUILDINGS • HOMES  
FACTORY OFFICES • APARTMENTS • SCHOOLS

...

HERE ARE A FEW TYPICAL EXAMPLES  
OF ART METAL LIGHTING CREATIONS

### TAKE ADVANTAGE OF OUR ENGINEERING SERVICE

Art Metal offers you more than just a source of supply for scientifically correct and eye appealing fixtures . . . we maintain a free consultation bureau to help you obtain, through the added experience of our illumination experts, maximum benefits from engineered light conditioning. This unique service assures a more efficient application of lighting facilities . . . and a more profitable, as well as more satisfactory, installation when completed. Write for details.



All Art Metal Fixtures are laboratory tested. Here, for instance, is the light distribution curve for the fixture above.

# THE ART METAL CO.

CLEVELAND...OHIO

# Better Lighting

## RESORT LIGHTING

Lighting a hotel parking lot seems like an easy job, but one order tackled by Thomas F. Broady, electrical contractor of Maryville, Tenn., required plenty of ingenuity.

The parking lot adjoined a resort hotel set high in the Smoky Mountains and the management ruled out any conspicuous type of lighting equipment or floodlights as incongruous with the rustic scene.

The parking lot was surrounded by a low stone wall. Broady solved the problem by designing a special recessed fixture unit consisting of a box 12½ by 8½ by 8-in. set flush in the wall.

The recessed units have a cover of horizontal louvers backed by clear glass. The glass protects the interior of the fixtures from dirt and dust and the louvers direct the light downward from the line of vision of the motorist and protect the glass from flying stone.

## LIGHTING CLEVELAND'S NEWEST THEATRE

The Shore Theatre, located on Cleveland's Lake Shore Boulevard, is new and outstanding. To architect Paul Matzinger and the Robboy Electric Company goes the credit for an unusual lighting job, from the filament and fluorescent lamp lit front, through the lobby, with its cove of blue, pink and gold fluorescent lamps, to the beautifully designed auditorium shown here.

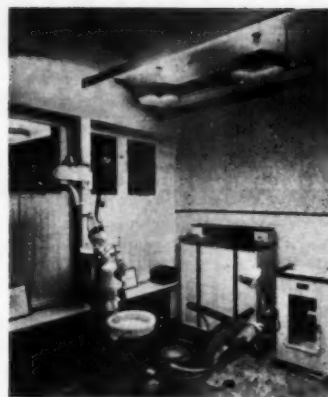
The auditorium is lighted indirectly by a system of filament lamps concealed in a long panel which bisects the room. This panel is 112 feet long and suspended 18 inches below the ceiling. It contains 196 50-watt inside frosted filament lamps, 112 15-watt yellow lamps, and 112 25-watt rose colored lamps.

During intermissions a touch of color is provided by fluorescent lamps located on the ceiling. Each contains two 30-watt gold and one 30-watt blue tubes.

## LAMPS IN HAZARDOUS LOCATIONS

Considerable study has been given to the dangers of using incandescent lamps in atmospheres such as are found in flour mills or grain elevators, where disastrous dust explosions might occur. For a fire may be started with any incandescent lamp, vacuum or gas-filled, if operated for a considerable length of time in an atmosphere which allows the heat energy to accumulate. Actually, the surrounding material can continue to rise in temperature until it reaches a point where the energy is dissipated as rapidly as it is supplied. If combustible materials are present and the final temperature is high enough, a fire may be expected. The ignition temperature of durum wheat dust is around 510° F, of cornmeal about 930° F. Smoking temperatures are considerably less.

Though the ignition temperature of the different atmospheres is variable, units having exposed surfaces whose temperatures are in the neighborhood of 150° F may be considered as safe to use. Many vapor-proof lighting units are now commercially available for use in atmospheres containing gas or explosive oil vapors. The use of portable



**LIGHTING DENTIST CHAIRS**—Large area sources of relatively low brightness have been extensively used in the industrial work world but lighting a dentist's chair is certainly a new application. This installation is in the office of Dr. P. N. Doremus, Red Bank, New Jersey. It consists of a Curtis Lighthood mounted 8 feet above the floor and equipped with two 150-watt Silvered Bowl lamps. The fifty foot-candles of shadowless illumination have won the enthusiastic approval of both Dr. Doremus and his patients.

lamps on drop cords is prohibited around grain bins. For at times, such lamps are allowed to become actually buried in grain and the fire hazard is extremely great in such cases with any size or type of lamp. Obviously the temperature builds up to a quite high value when there can be little radiation from the bulb.

Incandescent lamps should be used only with outer globes or other protective devices which will eliminate the possibility of the lamp ever being broken, with the hot filament in contact with the explosive mixture.

Various means are used to decrease the chance of accidental lamp breakage. But the incandescent lamp when properly installed and used is, by far the safest for hazardous locations.



**COLOR DECORATION**—Cleveland theatre lighted by a combination of yellow and rose tinted mazda lamps, with gold and blue fluorescent tubes.

# Announcing The New ...



## FLUORESCENT GENERAL LIGHTING FIXTURES FOR INDUSTRIAL APPLICATIONS

### FOR TWO 40 WATT LAMPS

The Day-Brite "TWO-FORTY" is recommended for lighting production areas where plenty of cool, daylight quality illumination is desired. With conventional 10 foot spacing and mounting heights, 20 foot candles or more of smooth, even illumination is uniformly distributed over the working surface.

**BETTER SEEING FOR BETTER PRODUCTION . . .** The "TWO-FORTY" wipes out all harsh shadows . . . eliminates eye-strain . . . reduces spoilage and rejects . . . and provides ideal seeing conditions for all types of work.

**SMART APPEARANCE . . .** Exterior finished in light gray. Has permanent white porcelain enamel reflecting surface.

**HIGH POWER-FACTOR . . .** New type Tulamp ballasts correct power-factor and flicker. Removable starting switches are located in sockets.

#### A COMPLETE FIXTURE-READY TO INSTALL

. . . The "TWO-FORTY" is completely wired with sockets, lamp starters, starting compensator, heavy duty 3-wire rubber covered cord, plug and Tulamp high power-factor ballast for 110-125 or 220-250 volt, 60 cycle, A. C. operation. It is arranged for either pipe or chain suspension and the reflector is hinged for easy access to interior of fixture.

*Higher Efficiency*

*50% Cooler in Operation*

*Longer Lamp Life*

*Minimum Maintenance*

*Ease of Installation*

*Uniform Distribution*

*Accurate Color Correction*

*Low Surface Brightness*

Bulletin F-18 fully describes the "TWO-FORTY" — Write for your copy today.

Available After February 1, 1940.

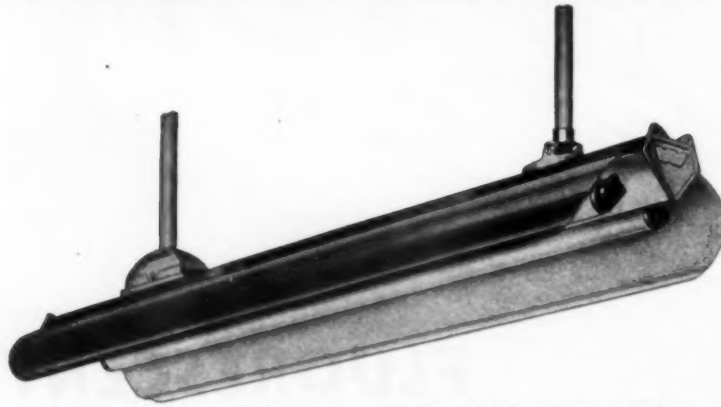
## Day-Brite Lighting, Inc.

5421 Bulwer Ave.

St. Louis, Missouri



# For the GENERAL ILLUMINATION of Industrial Areas—THE WHEELER "DAY-FLO" FLUORESCENT LIGHTING UNIT



*A new two lamp unit (40 watts each) incorporating the new Tulamp ballast equipment*

Here is a new two lamp (40 watts each) porcelain-enameled, "Daylight" Fluorescent unit that does an exceptionally good job of General Lighting in industrial areas. The unit provides an abundant quantity of the cool, pleasing daylight illumination which tends to reduce spoilage and rejects, and, in addition, is much more comfortable to work under.

The "DAY-FLO" provides color-corrected light, is highly efficient, cooler in operation, ideal for color matching, easily installed, and easily serviced.

Unit is available for 110-125 volt, 119-216 volt, or 220-250 volt operation, and is furnished complete with sockets and Tulamp ballast equipment. Can be supplied wired or unwired.

The "Day-Flo" can be furnished for any of the three following methods of suspension:

1. FOR CHAIN SUSPENSION. All units are supplied with loops in the cast ends for chain suspension. Chain is not furnished. A removable metal cover plate, complete with a composition bushing, fits over an opening in the wiring channel of the unit thus forming a readily accessible splicing chamber. Cover can be removed or replaced simply by turning. When cover plate is removed, cord can be passed through the bushing and wiring connections easily made. If bushing is removed, BX connector can be inserted.

2. FOR STEM AND CHAIN SUSPENSION. Unit is supplied with a new Hinged Suspension Canopy located 11" from end of fixture and with loops on cast ends for chain. Canopy swings open upon release of a single screw, exposing pigtailed for quick and easy splicing. Complete unit can be separated from upper portion of the canopy by removing two pivot screws. Canopy is tapped for 1/2" pipe.

3. WITH TWO STEM SUSPENSION. Unit is supplied with Hinged Suspension Canopy described above, and also with a Hinged Hanger which also swings open upon release of a single screw. Canopy and Hanger are tapped for 1/2" pipe.

For complete data write for New Bulletin No. 62-A

Distributed Exclusively Through Electrical Wholesalers

## WHEELER REFLECTOR COMPANY

275 CONGRESS ST., BOSTON, MASS.

NEW YORK

ATLANTA

CLEVELAND



[FROM PAGE 28]

### LIGHTING A CHURCH AUDITORIUM

Seven footcandles are provided in this auditorium of All Souls Church, Alhambra, California, by a combination of luminous ceiling and pendant equipment. The ceiling panel is an exposed Lamella truss open to a flat ceiling in

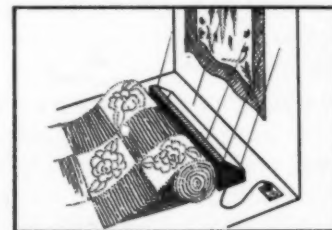


*BRIGHT SKY effect in this California church is produced by combination of luminous ceiling and pendants*

a clear story above. The windows in the clear story are set back to be out of the line of vision. Seventy-five-watt lamps on 18-inch centers are located on the catwalk below the windows. These lamps light the ceiling, seen through the truss members. The 5 footcandles provided by this system are well distributed and extremely comfortable.

The other system consists of eight 200-watt lamps in Wagner Woodruff special units, spaced on 17' x 25' centers and mounted 15' above the floor. This system provides another 2 footcandles.

Accent is given to the altar by the use of two 150-watt projector lamps. The lamps are concealed from view by being hidden above the truss.



*DISPLAY BACKGROUND—Sections of portable trough reflector are very handy in arranging special display lighting. Where the center of interest is on the background, these troughs may be hidden behind merchandise on the floor, concealed in a vertical position at the sides, or suspended from above to flood additional light on the display.*



BRIGHT SPOTS IN THE WIRING PICTURE

# H&H IVORYLITE

## RECEPTACLES SWITCHES UNILINE PLATES

UNILINE  
TRADE MARK

No. 1913-I Receptacle  
with No. 92101 Plate

No. 1913-I

No. 1881-I Switch  
with No. 92071 Plate

No. 1881-I

FOR YOUR LIVE RESIDENTIAL FIELD



They're "Bright Spots in the Wiring Picture" — equally for home owner and Contractor. Rich, ivory-like IVORYLITE has a style-appeal so aptly in harmony with today's decorative tastes!

Structural merit backs up the style. Duplex Receptacle has full-floating contacts, adjusting automatically to alignment of the plug prongs with a firm, positive contact. Switches also have self-aligning contacts; completely enclosed Bakelite bases, compactly small for generous wiring room. Solid IVORYLITE neck and operating lever.

Switches are available in single-pole (No. 1881-I) and 3-way (No. 1883-I); listed as standard by Underwriters Laboratories; rated 10 Amps., 125V.; 5 Amps., 250 V. Plates are of standard UNILINE design with universal trade-numbers, interchangeable for all makes of devices.

The IVORYLITE Line, (brown Bakelite optional), includes Radio Outlets and multiple-gang combinations of Switches, Pilot Lights and Receptacles. All in all it's the line of today and tomorrow: ... be sure you have all the data on hand for properly equipping each job; ask us to see to that!

SOLD THROUGH YOUR

**HART & HEGEMAN DIVISION**  
THE ARROW-HART & HEGEMAN ELECTRIC CO. HARTFORD, CONN.

ELECTRICAL WHOLESALER

# Motor Shops

## WINDING BENCH

Small motor rewinds on a production basis require efficient use of space. At the Tennessee Electric Motor Service shop in Nashville, Tennessee, two armature winders work on a 6 ft. bench designed to eliminate non-productive time.

Armature stands are at the front of the bench. Along the back is a rod



**COMPACT WINDING bench keeps everything within easy reach for production efficiency.**

to support magnet wire reels which acts as a spindle and allows the reels to revolve freely. It is supported on three notched blocks.

On the backboard within easy reach are small tools and gages and a shelf below the bench provides space for varnishes and the mechanics' tool kit.

## HOIST TRACK CIRCULAR

Stripping, cleaning, and stator true-up work at the Electric Engineering and Construction Co. of Des Moines, Iowa, is handled in a department laid out in a quarter segment. The elevator shaft forms one side of the segment, the booths and benches are arranged in a quarter circle with testing department at the center.

To handle heavy stators, the hoisting

track consists of a radial eye-beam, hinged at the testing department, with the outer end traveling over a circular track above the cleaning and stripping benches. This arrangement permits convenient handling of heavy equipment through the department with a minimum of mono-rail structure.

## MACHINE FOR CARBON BRUSHES

The motor repair shop of Walter J. Rider at Binghamton, N. Y., often has calls for odd size carbon brushes for motors which have long been off the market but are still performing satisfactorily. This means long delays due to special orders and to accommodate his customers Mr. Rider now makes the brushes in his shop.

To facilitate making these brushes, he built a machine to cut the carbon and grind the brushes to the proper size. This machine consists of a  $\frac{1}{4}$  hp., 110-volt, 1750 r.p.m. single phase motor with a double end shaft. On one end of the shaft a carborundum circular saw is mounted and on the other end a carborundum grinding wheel. An adjustable guide bar on the cutting table permits cutting a carbon block to any size desired. An adjustable angle guide on the grinding end permits beveling the contact surface of

**RADIAL BEAM and circular rail hoist layout carries heavy equipment through cleaning and stripping department.**



**COMBINATION CUTTING and grinding machine for making carbon brushes, and cutting wood, fibre and other materials.**

the brush from 90 degrees down to 30 degrees.

A vacuum cleaner motor mounted under the table and connected by ducts to the cutting and grinding ends of the machine, draws the carbon dust from the working plane and deposits it in a receptacle mounted on the table framework. An adjustable suction valve permits drawing the dust from the grinder in one position and from the saw in the other.

When not used to make carbon brushes, the machine can be used to cut and sand wood, fibre or other materials by replacing the carborundum attachments with a steel saw.

## SPOOL RACK

Compact racking of wire reels and tape spools is worked out at the Excel Electric Service Company in Chicago on an ingenious frame.

Four 2 by 2 in. angle uprights are



EQUIPMENT LISTED BY  
UNDERWRITERS'  
LABORATORIES, INC.

# Fluorescent CurtiStrip

Here's the deep  
symmetric type...  
There are shallow  
symmetric and  
asymmetric  
reflectors,  
too.

**NOW** FOR USE WITH  
NEW STARTER SWITCHES AND  
BOTH ONE — OR TWO — LAMP  
AUXILIARIES.

*Miles and miles  
have been sold!*



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Made to  
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## GIVE YOUR BUSINESS A BOOST **NOW**



HERE'S YOUR OPPORTUNITY—

# QUAD

## FLUORESCENT LIGHTING UNITS

Here's the new type of lighting that has unlimited possibilities for Contractors. Daylight illumination is becoming more and more necessary, not only for jobs requiring accuracy and precision but for the many large industrial and commercial organizations where increasing demand makes it necessary to work the clock 'round. These need daytime illumination too. QUAD will give you these installations that mean real gain and steady income. The basic unit shown can be worked into many combinations all meaning more installation work for you.

This new QUAD Fluorescent Unit will give you a new start for the new year and we'll be glad to send you any and all information to help you make that new start a good one—just ask for it.

### A NEW 112-PAGE CATALOG

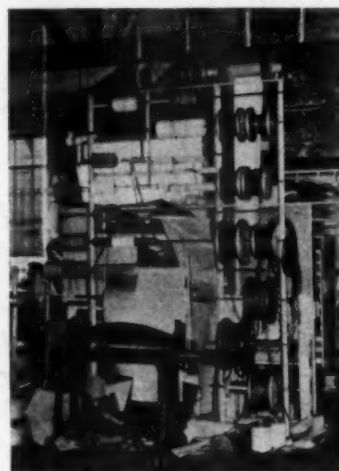
Send for this new catalog which gives you full details and information on the complete QUAD Line of Lighting Units.

**QUADRANGLE MFG. CO.** 32 S. PEORIA ST.  
CHICAGO, ILL.



[FROM PAGE 32]

braced from a roof truss to the floor. Slots, cut diagonally in the web of the angles, support conduit spindles over which the wire reels and tape spools are placed. Located adjacent to the winding department, the entire assembly occupies very little floor space.



*REEL RACK provides compact and convenient access to wire and tape.*

### BURNED TO STRIP

To avoid excessive strain on stator laminations, stator windings are burned clean of insulation before stripping at the Electric Engineering & Construction Co. of Des Moines, Iowa.

A brick oven, large enough for the usual run of shop work is mounted at the rear of the stripping bench. After the insulation is burned, the coils are cut and pulled out. The stator continues down the line for cleaning and the scrap wire is baled for junk.



*BURN-OUT oven clears away insulation for easy stripping.*





If It's Service  
You Want

Klein's No. 201NR  
Side Cutting Plier  
Handles — shaped  
to fit the hand—  
provide powerful  
leverage. "Stream-  
lined" feature per-  
mits easy opera-  
tion in confined  
space.



## Use the "Pliers of the Professionals"

When you work with a tool every day—and good workmanship depends on its operation—you want to be sure of its quality.

Klein pliers are made for just such requirements. Their uniformity and unequalled high quality—their keen hand honed cutting knives—their correct temper—their comfortable feel—have won the recognition of good electricians and mechanics everywhere. Kleins are the "Pliers of the Professionals."

Kleins are built by craftsmen to exacting specifications—rigidly inspected and tested, and you are assured of maximum value in every pair. Kleins not only mean superlative service, but lowest overall cost. Ask your jobber or write.

# KLEIN PLIERS

# There's a Long Story Behind These Pliers You Buy

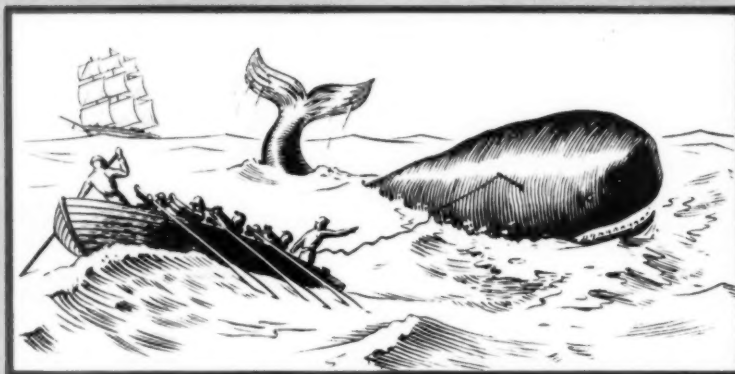
## The Story of a Great American Business

### FIRST A LOCKSMITH WHO MADE BETTER HARPOONS

To find a new freedom, Mathias Klein came to America almost a hundred years ago. By profession he was a journeyman locksmith, but he soon "signed" on a whaling schooner and became the blacksmith's helper.

Here was experience that later helped him found Mathias Klein & Sons. For here he helped forge and temper harpoons—to sharpen their points and flukes—to weld the eyes that took the lines.

His work was good; for after a while the harpooners preferred the work of the helper—young Klein—to that of the smith himself.



### THEN WESTWARD TO NEW OPPORTUNITY

After the three-year voyage, he traveled westward—by trains—by canal boats—and by wagons to Chicago. And, after working for a while, he set up his own forge in a section that is, today, a part of Chicago's "Loop."



### A NEW WORLD SERVICE • THE TELEGRAPH

History was in the making. The first transatlantic cable—the first transcontinental telegraph—our modern communication system was just beginning. Remembering the sharp points on his harpoon, Mathias Klein fashioned the first climbers for pioneer linemen, who had formerly had to carry ladders from pole to pole. So began his service to the electrical industry.



### THE FIRST KLEIN PLIER MADE BY HALVES

His fame among linemen grew. Soon one worker brought his broken imported plier to be fixed. Mathias Klein could help him, and he hammered and fitted and tempered a new half, and the lineman went away happy. A few months later, however, he returned and said, "If you match up your new half with another new half, instead of the old one, and temper it the same way, I'll have a plier that can't be beat." And so it was that the first Klein plier—a better tool—was made a half at a time—months apart.

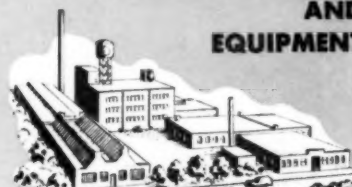
### MORE TOOLS BUT NEVER MASS PRODUCTION

Mathias Klein made other tools as the demand grew. Splicing clamps, different types of pliers, safety belts and straps, and other equipment. But always with one thought in mind—better products.

Orders increased, improvements were made with experience, but the fundamental idea has always been maintained: the production of the best possible equipment by craftsmen who understand their raw materials.



### TODAY, MODERN FACTORIES AND EQUIPMENT



As Klein tools have become the standard of the industry, Klein factories have grown. Modern equipment in the hands of experience carries on the Klein tradition. The same Klein quality is maintained under the active direction of members of the same Klein family—now in the third generation.

### AND A PLEDGE

The same Klein standards will be maintained. The Klein management will not tolerate any compromise with quality or safety. Klein Pliers today, as in the past, give you that uniformly long service that means dependable results at lower overall cost.



Foreign Distributor—International Standard Electric Corporation, New York, N. Y.

Mathias **KLEIN** & Sons  
Established 1857

3200 Belmont Ave., Chicago, Ill.

## A "THANK YOU!" TO THESE GENTLEMEN

THERE are a lot of generous and helpful people in the world. For example, the gentlemen who have been assisting us with the preparation of this series of Maintenance Guide Sheets.

Throughout the past two years we have been publishing these articles on modern maintenance practice, a quick review of the more important electrical equipment that comes under the care of the industrial electrical maintenance staff, and the industrial electrical contractor, who maintains factory systems. In each case, we have turned to the engineer of some prominent manufacturer of the equipment treated, for data and guidance.

Periodically we have published the names of these men who have so kindly contributed out of their specialized knowledge. And now again we wish to extend our thanks—this time to—

W. A. Holland of General Electric Co.  
N. A. Tornbloom of Appleton Electric Co.  
A. A. Emlen of American Transformer Co.  
H. E. Schleicher of Arrow-Hart & Hageman Electric Co.  
G. E. Rolston of Rome Cable Corp.  
John M. Turnbull, of Springfield, Mass.  
E. R. Rath of Power Transmission Council, Inc.  
Triangle Conduit & Cable Co.  
Anaconda Wire & Cable Co.

Previous articles of this series have covered—

1. Alternating Current Motors
2. Direct Current Motors
3. A.C. Motors—Maintenance
4. D.C. Motors—Maintenance
5. A.C. Motor Controllers
6. D.C. Motor Controllers
7. Maintenance of Control
8. Special Control Problems
9. Electric Distribution
10. Lighting
11. Electric Heat
12. Electric Welding
13. Interplant Communication
14. Instruments
15. Power Tools
16. Batteries and Rectifiers
17. Electroplating
18. Electronic Devices
19. Circuit Breakers
20. Equipment for Hazardous Locations
21. Transformers
22. Wiring Devices and Fittings
23. Wire and Cable
24. Belts and Pulleys (this issue)

Coming articles will discuss

25. Couplings, Gears and Chains
26. Elevators, and Industrial Trucks
27. Conveyors, Cranes and Hoists
28. Ventilating Air Conditioning
29. Management of Maintenance

ELECTRICAL

# Maintenance

## DRIVES . . . Part One

### PULLEYS, BELTS AND FLEXIBLE SHAFTS

#### Types and Applications

ELECTRICAL maintenance men are inevitably involved with mechanical power transmission equipment. They need as full a knowledge of drives as of the electrical devices for which they are responsible. The general subject breaks down into two classes—pulleys, belts and flexible shafts, which provide a "flexible" type of drive, and the various types of couplings, gears and chains.

This quick review of "flexible" drives presents the major types, the characteristics and where to use them. Suggestions are also made as to their selection and how best to keep them in working condition.

#### Types of Pulleys

Pulleys for flat-belt drives on head-, jack-, line-, and counter-shafts are available in five types: cast iron, pressed steel, wood, wood rim with iron spider, and paper with metal hub. These types vary in design in that they may use a solid rim and hub, solid rim and split hub, split rim and hub, crown face, step cone, external flanges, as well as keyways or metal compression bushings. These pulleys can be obtained in practically any diameter and face, and for any speed required, within certain limitations.

Cast iron pulleys can be used for practically any line-shaft or machine application and for service where there is excessive dampness and acid fumes. They are suitable where shock loads are encountered.

Pressed steel pulleys are lighter in weight and lower in cost than a cast

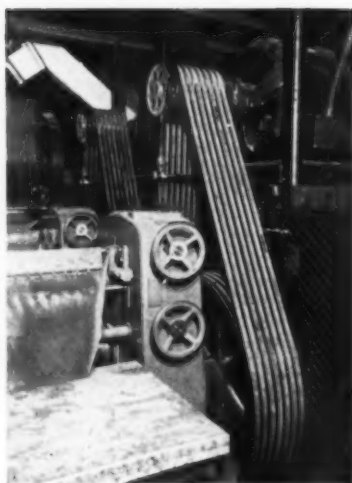
iron pulley. This type resists shock loads, may be used on regular shaft installations, and where it is not subject to excessive moisture or acid conditions.

Wood split pulleys are built up of wood segments so that the end grain is to the belt. They are light in weight, have a higher coefficient of friction than the metal pulleys, will stand shock loads, and are relatively low in price.

... AND VERTICAL DRIVE to meet the conditions. A 5-in. flat leather belt transmits power from a 7½-hp., 1800 r.p.m. motor to a double buffer, on a short center with a Rockwood pivoted motor base. (Chas. A. Schieren and Co. photo)







**MAKING SOAP CHIPS**—V-belts and variable-pitch sheave on motor for short-center (29.8 to 30.9 in.) drive. Roller mill speed 205 to 240 r.p.m. motor 30 hp, 860 r.p.m. Pitch diameter of small sheave adjusted by chain mechanism. (Allis-Chalmers photo).

Their application is for any power transmission except where subjected to acid fumes and extreme moisture conditions. They are safer than a metal pulley in explosive atmospheres where sparks and static electricity present a hazard.

**Wood-rim pulleys**, with iron spider, are constructed of a rim of maple segments and fitted with iron arms and hub. Light weight and relatively greater strength permit high rim speed with safety. Their characteristics lie between the metal and wood pulleys, and their application is the same as the wood pulley.

**Compressed wood pulleys** are made of laminated layers of wood, have iron hub, and a high coefficient of friction. They may be used for practically any power transmission application, and being waterproofed, will withstand normal moisture conditions.

**Paper pulleys** are constructed of compressed fiber board, and, depending on their size, have different forms of metallic centers. They will withstand shock loads, have a high coefficient of friction, are safer than a metal-rim pulley in atmospheres where sparks and static electricity present a hazard, and will resist acid fumes for a long time. This type of pulley is applicable for practically any power transmission and is obtainable with special waterproofing for more severe moisture conditions or outdoor exposure. The cost is approximately the same as for a wood-rim pulley.

Flat-belt pulleys, whether for motors or shafts, are furnished with a crown face, unless a flat face is specifically

ordered. Crowning helps to correct slight misalignment and keeps the belt on the pulleys. But if the crown is too high the belt will be thrown off.

#### Types of Belting

Basic shapes of belts are flat, round and "V". Each shape has individual working characteristics, regardless of material and construction.

A flat belt operates on a flat pulley, is a single strand that automatically distributes its load and stretch within itself, bends more easily than any other shape, and is relatively less affected by the wear and tear of flexure. On short-center and vertical drives, tension is maintained by an idler pulley or pivoted motor base.

A round belt operates on a grooved pulley. All sides of the belt are presentable to the pulley so that it may be turned, twisted or crossed. This shape of leather or fabric-base belting is applicable in general for fractional-horsepower drives. The V-shaped belt is treated in another section of this discussion.

The two general types of belting most commonly used for either group or individual drives are leather and fabric-base. The latter is constructed of various materials.

**Leather belting** may be either vegetable or oak tanned, or mineral or chrome tanned. Vegetable tanned belting, if of a non-waterproof type, may be used in the presence of mineral oil, but is non-resistant to steam, excessive moisture and high temperatures. Waterproof types resist moisture but acids will have a deleterious effect. Mineral tanned belting is more pliable, has a higher coefficient of friction and greater capacity for transmitting power, and if waterproof, resists water, moisture, mineral oil; also the action of corrosive acid fumes and vapors is slow. Belting may be given a combination of the good qualities of various tannages, by attaching a ply of vegetable tanned leather to one of mineral tanned.

**Rubber belting** is made up of plies of rubber and impregnated cotton duck, or cords, or both, all vulcanized to form a finished belt. This type of belting has (1) elasticity with little stretch; (2) protection against moisture, acids, alkalis and oils, by proper compounding and construction; (3) many gradations of coefficient of friction; (4) uniformity of quality and dimensions; and (5) many belt thicknesses.

**Balata belting** is made of closely woven cotton duck of high tensile strength and impregnated with Balata gum. This belting has durability, a small amount of stretch, a high co-

efficient of friction even when used in damp or outdoor locations, and is non-resistant to mineral oil and acid fumes.

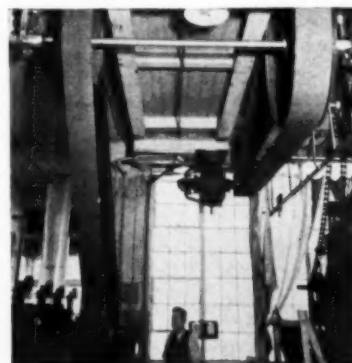
**Camel's-hair belting** is made of tightly woven camel's hair and cotton yarns and impregnated with heavy oils. This belting is highly elastic and flexible, and must be kept very tight on the pulleys. It has a relatively high coefficient of friction, absorbs shocks, is moisture-proof, slowly resists acid fumes, is affected by excessive mineral oil, and tends to stiffen by exposure to alkalis.

**Belt dressing** should be applied once a month or more often according to operating conditions. Dressing is used on leather belting: (1) to reduce friction of internal fibers due to flexing of the belt, and (2) to maintain the coefficient of friction on the pulley sides by keeping the belt in a soft, pliable condition. Dressing is used on rubber belting to keep the pulley side pliable and free of glaze and foreign matter. It is one remedy for the poor frictional surface caused by "bloom" which is a result of sulphur or other materials coming to the surface. But no one kind of belt dressing is applicable for all the various types of belts. Only these dressings recommended by the manufacturers of respective types of belts should be used.

#### Care of Flat-Belt Drives

Important check points to follow in the maintenance of pulleys and belts are:

1. Check alignment of driver and driven pulleys.
2. Remove dust and grease from face of pulleys only when they are idle.
3. See that pulley keys and setscrews are tight and do not protrude.
4. Check for pounding and vibration.
5. Check operating conditions such as atmospheric, speed and load.
6. Run grain side of belt next to pulley.
7. Apply belt dressing frequently.



**IN A SOUTHERN BLEACHERY**—This drive includes rubber belts, from motor to countershaft to squeeze rolls (Raybestos-Manhattan, Inc. photo)



# MAINTENANCE GUIDE CHART

## FLAT-BELT DRIVES

### SELECTION

Factors to be considered in the selection of

#### A. PULLEYS —

1. Service, horsepower and speed
2. Dimensions, diameter, face and bore
3. Method of fastening to shaft
4. Balance, also true diameter
5. Strength, weight and flywheel effect required
6. Condition of face, smooth to prevent belt wear but having high frictional value

#### B. BELTS —

1. Horsepower to be transmitted
2. Diameter and speed of driver and driven pulleys
3. Center distance between pulleys
4. Angle of center line
5. Weight, duty and friction of surface
6. Kind of pulleys and friction of face

#### C. BOTH PULLEYS AND BELTS

1. Shock and overload conditions
2. Atmospheric conditions; moisture, alkali, acid fumes
3. Facility for installing or removing
4. Type of face; crown or flat
5. Tight or loose pulleys
6. Adequate diameter of pulley, for a belt speed not to exceed 5,000 ft. per min.

### MAXIMUM RIM SPEEDS FOR PULLEYS

Pulley Construction			Maximum Safe Rim Speed, ft. per min.
Type	Rim	Arm	
Cast Iron, Regularly balanced	Solid or split	Split	3,750
Specially balanced	Solid or split		4,500
Specially balanced	Split		6,000
Specially designed	Solid		7,000
Steel (Pressed)			
Normal duty	Split	Regular split Special split	5,000
Heavy duty	Solid or split		Special
Iron Spider			
Steel rim	Solid or split		6,000
Wood rim	Regular split	Regular split Special split	5,000
	Regular solid		6,000
	Special solid		10,000
Paper rim	Solid		8,000
All-Wood	Split	Solid	5,000
Compressed Wood	Solid		5,000
Paper	Solid		5,000

Data on layout and design of belt drives is available in the following handbooks:

Marks, L. S., Mechanical Engineers' Handbook.  
 Stanier, Wm., Mechanical Power Transmission.  
 O'Rourke, C. E., General Engineering Handbook.

## V-BELT DRIVES

When selecting a V-belt drive, the facts that must be known are: (1) Horsepower and speed of driver and driven machines; (2) Character of load such as overload, shock, high starting torque, steady, reversing; (3) Maximum and minimum distances between sheave centers. Using this data as a basis, the size and number of belts can be determined by referring to the manufacturer's tables. The accompanying tables and formulas will be helpful in calculating Texrope Drives.

TABLE I — Suitable Texrope Sizes for Various Horsepowers and Speeds

Normal Horsepower	Nominal Motor Speed, r.p.m.					
	1750	1450	1150	870	690	495
	Size of Belt, Section					
$\frac{1}{2}$ to $1\frac{1}{2}$	A	A	A	A		
2 to 3	A or B	A or B	A or B	A or B		
5	A-B	A-B	A-B	A-B		
10	A-B	B	B	B	B or C	C
15	B	B	B or C	B or C	C	C
20	B-C	B-C	C	C	C	C
25 to 30	C	C	C	C	C	C
40	C	C	C or D	C or D	C-D	D
50	C or D	C-D	C-D	C-D	D	D
60	C-D	C-D	C-D	D	D	D
75	C-D	C-D	C-D	D	D-E	D-E

TABLE II — Nominal Horsepower Ratings of Single Texrope Belts, According to Belt Size and Pitch Diameter of Sheaves, for Various Belt Velocities

Belt Velocity, ft. per min.	Size of Belt, Section				
	Section A $\frac{1}{2} \times \frac{1}{2}$ in.	Section B $\frac{3}{4} \times \frac{1}{2}$ in.	Section C $\frac{5}{8} \times \frac{1}{2}$ in.	Section D $1\frac{1}{4} \times \frac{3}{4}$ in.	Section E $1\frac{1}{2} \times 1$ in.
	Minimum Pitch Diameter of Sheave, inches				
	3.0	5.4	9.0	13.0	21.6
	Horsepower Rating of Belt				
1,000	0.9	1.2	3.0	5.5	7.5
2,000	1.7	2.3	5.5	10.0	14.0
3,000	2.4	3.2	7.5	14.5	19.5
4,000	2.8	4.2	9.0	17.5	23.5
5,000	2.8	4.2	9.0	17.5	23.5

$$\text{BELT LENGTH: } L = 2c + 1.57(D + d) + \frac{(D - d)^2}{4C}$$

Where L = Pitch Length of Belt, D = Pitch Diameter of Large Sheave, d = Pitch Diameter of Small Sheave, C = Center distance of Sheaves.

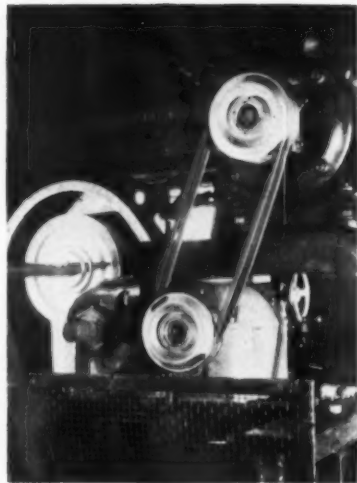
BELT SPEED:  $V = \text{PD of Driver Sheave in inches} \times \text{RPM} \times .262$   
 Where V = Velocity of Belt in ft. per min.

Pitch Diameter of Driven Sheave:

$$\text{pd} = \frac{\text{RPM of Driver}}{\text{rpm of Driven}} \times \text{PD of Driver}$$

Horsepower values in Table II must be corrected for overload, arc of contact and exact center distance; for factors see manufacturer's data.

Tables and formulas courtesy of Allis-Chalmers Mfg. Co.



**SPEED CHANGER** (below motor) provides variable speed for a special lathe. Input speed 1,200 r.p.m., output 620 to 2,320 r.p.m. Texrope drive from motor to speed changer to shaft at left (Allis-Chalmers photo).

8. Keep normal tension on belt and avoid flap.
9. Run belt with tight side on bottom, whenever possible.
10. Avoid slip caused by a stiff or slack belt or by a pulley that is too small.
11. Use pulley having a face width greater than the belt width.
12. Run inside points of laps on single and triple-ply belts toward the pulley; on double-ply belts, in opposite direction.
13. Apply tightener on slack side of belt.
14. Put endless belt on pulleys without an overstrain on the cord or fabric.
15. Use safeguards around belts and pulleys and keep them in place.

#### V-Belt Drive

"V" shaped belts have various constructions but, in general, are made of cotton cords impregnated and embedded in rubber, with the carcass covered with impregnated fabric. They are impervious to moisture, dirt and dust, and require no dressing. However, excess moisture tends to reduce the coefficient of friction. Operations in temperatures exceeding 130 deg. F., in presence of oils and chemicals require special engineering service. They are made endless, are available in standard lengths, and have been developed very successfully for short center drives.

This type of belt runs in accurately machined grooves in cast-iron or steel sheaves, which must have exact alignment. High tension ratio is obtained by a wedging action when the belt seats in the groove.

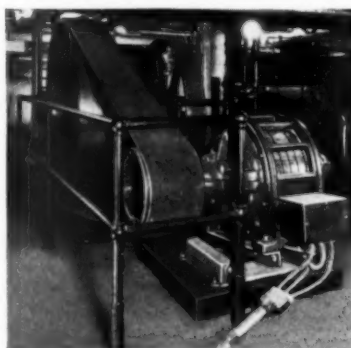
V-belts are applicable where the belt velocity is between 1,000 and 5,000 ft. per min., and at speed ratios from 1:1 up to 10:1. The most desirable center distance is between 1 and 1½ times the diameter of the larger sheave.

Approximate tension for an A size belt is 4 lb. per belt. For B belt, it is 80 lb., C belt 125 lb., D belt 300 lb., and E belt 400 lb. Approximately correct running tension can be obtained by measuring the center distance and adding 0.5 per cent of that distance. Over loads must be taken care of when designing the drive. Approximately 10 per cent of the center distance must be allowed for an adjustment between centers for putting on or taking off belts and for taking up stretch.

Texrope drives may be run with two-thirds of the original belts in operation if the tension is maintained. The remaining belts can be run to destruction before replacing them with a complete new set.

Important check points to follow in the maintenance of V belt drives are:

1. Keep sheaves clean and avoid ac-



**SHORT-CENTER DRIVE** with a 13-in. double-ply flat leather belt, between an air compressor and a 75-hp. motor with pivoted base. (Rockwood Mfg. Co. photo).

cumulation of foreign matter in grooves.

2. Have driver and driven sheaves in exact alignment.

3. Maintain normal tension on the belts.

4. Never use belt dressing or resin on V-belts.

5. Occasionally wipe belts to remove dirt and protect them against oil.

6. About once a month, grease variable pitch sheaves and speed changer unit, but be sure that they are not over-greased.

**Adjustable Speed Drives**—The speed of a machine with a constant-speed motor drive may be changed by the use of a variable pitch sheave or a speed changer unit. The variable pitch sheave has an adjustable pitch diameter. Adjustment range is 1 to 1½, depending on the pitch diameter. The larger the sheave, the less the percentage of adjustment. When the diameter is changed, the motor should be moved to maintain proper belt tension.

A speed changer is an enclosed unit

having two variable pitch sheaves with a form of belt transmission between them. Diameter of the sheaves and speed output are adjusted manually or by mechanical or electrical remote control. Units are available for speed ratios up to 3¼:1 and ratings up to 75 hp. based on output speed.

#### Flexible Shafts

A flexible shaft is used for transmitting portable rotary motion. This method of power transmission is applicable where relative movement, position of parts and limited space is involved.

The size and casing of flexible shafts is determined by (1) torque, or horsepower and speed; (2) starting, stopping, reversing, acceleration or deceleration; (3) continuous or intermittent duty; and (4) unusual conditions such as abrasion, moisture and extreme temperature. Safe horsepower transmitted at a particular speed may be calculated from the formula:

$$HP = (TxN) \div (Fx5250)$$

where T equals allowable torque in lb.-ft. (manufacturer's value for respective core diameter in inches), N equals speed in r.p.m., and F is a factor, usually 4 for practical operation.

Shafts having ¼-in. core and a very low torque capacity (2¼ lb.-ft.) are suitable for operating indicators. Those with ½, ¾ and 1-in. core and allowable torque of 5, 11 and 18 lb.-ft., respectively, are used with portable tools and for remote control. Large flexible shafts are used for heavy duty service; for example, one having a 1¼-in. core and torque of 140 lb.-ft. will transmit up to 10 hp. at 1750 r.p.m.

Flexible shafts may be operated at 3,500 r.p.m. and higher speeds.



**FLEXIBLE SHAFTING** permits the machine to be taken to the work. Here is a wheel grinding operation on bore of a propeller for U.S.S. Bear, the ship which Admiral Byrd is taking to the South Pole. (Stow Mfg. Co. photo)



## READY NOW! FLUORESCENT LIGHTING UNITS BEARING THE RLM LABEL

These new Fluorescent Lighting Units made in accordance with the new RLM Standard Specifications make available an entirely new type of lighting for the general and local illumination of industrial and commercial interiors.

Depending upon the mounting heights, spacing and arrangement, 18 to 42 footcandles of daylight quality illumination are distributed upon the surface to be lighted.

By mounting units close together end-to-end to form continuous lines of light 8 to 10 feet apart, an unusual improvement in illumination is obtained. Such arrangement conforms to the modern functional trend in design and, therefore, makes possible an unusual improvement in general appearance.

Salient points of these new units are:

- A. *Porcelain Enamel Reflecting Surface for diffusion and durability.* Time has proven the durability, sustained efficiency and low maintenance cost of porcelain enamel. It is not affected by heat, cold or atmospheric conditions. It is easily cleaned.
- B. *78% Light Output Efficiency.* The design of the reflector, spacing of the lamps and high efficiency of the porcelain

enamel reflecting surface combine to produce an unusual high light output efficiency.

- C. *72½ Degree Cut-off.* An RLM cut-off standard for over 20 years and now generally accepted as good lighting practice. Insures adequate shielding of the light source from the side to minimize glare. In addition the ends of the unit are closed to further protect the eye.
- D. *Uses two 48" Mazda Fluorescent Lamps.* Approximately 100 watts used by lamp and auxiliary.
- E. *New Type Auxiliary Corrects Power Factor and Flicker.* Also equipped with removable and renewable auxiliary starting switches located in the socket.
- F. *Equipped with Auxiliaries Approved by the Underwriters' Laboratories.* All auxiliaries used in RLM units carry the approval of the Underwriters' Laboratories.

As with all RLM Lighting Units, the RLM Label affixed to a Fluorescent Lighting Unit is a warranty of conformance to RLM Specifications and is so attested to by the Electrical Testing Laboratories. New Specifications have been published giving complete information about this new unit. Ask your supplier of RLM reflectors or write Institute for a copy.

The letters RLM stand for Reflector and Lighting Equipment Manufacturers

**RLM STANDARDS INSTITUTE**

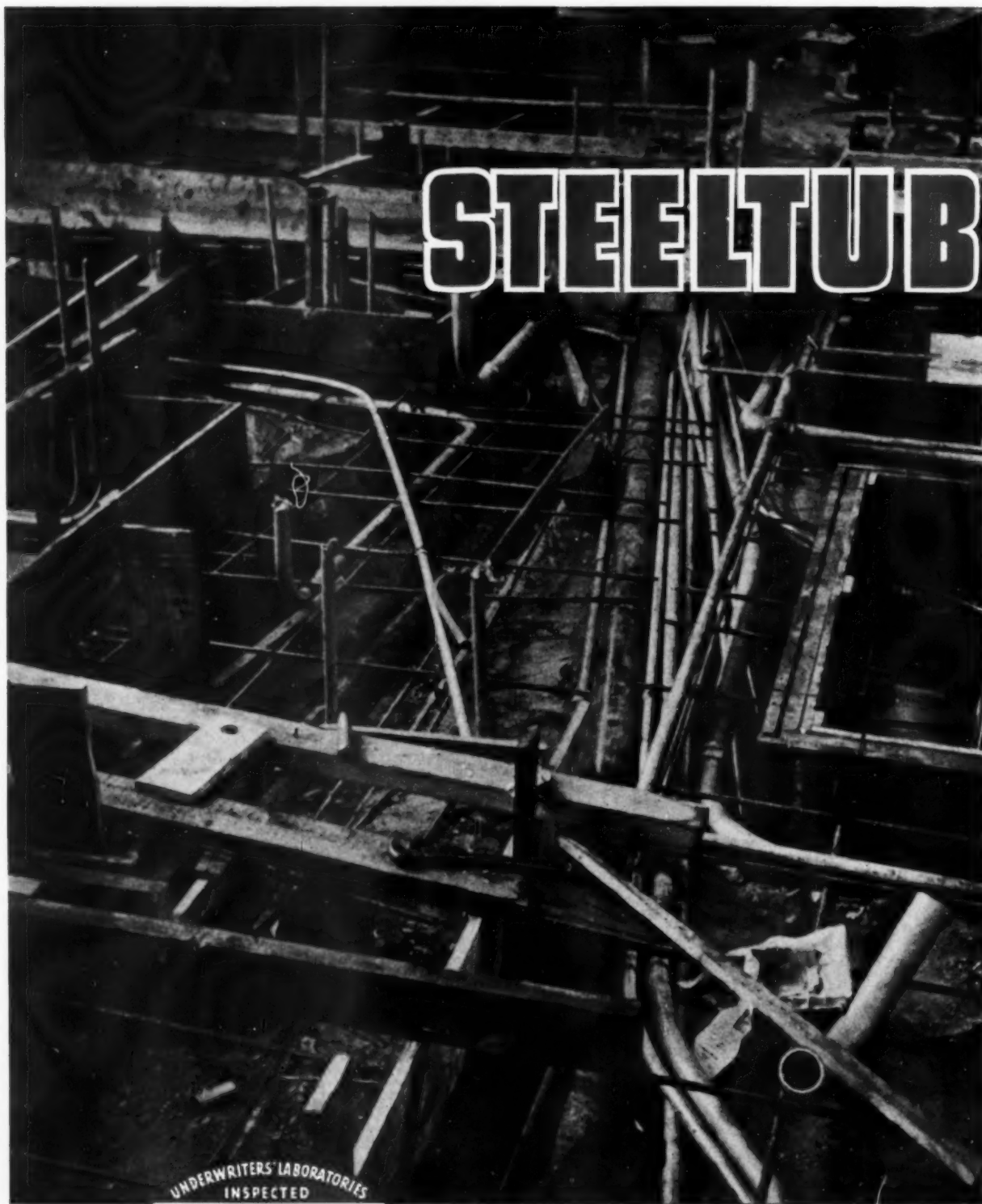
INCORPORATED

20 N. WACKER DRIVE • ROOM 1130 • CHICAGO, ILL.

THE CERTIFICATE OF



UNIFORM QUALITY



# STEELTUBES



*Look for this label. It is found only  
on genuine ELECTRUNITE Steeltubes.*

● W  
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*For industrial jobs—*

# ES IN CONCRETE!

● Where wiring jobs are rough and tough...in all types of industrial plants...ELECTRUNITE Steeltubes is the perfect raceway for concrete work.

Why?

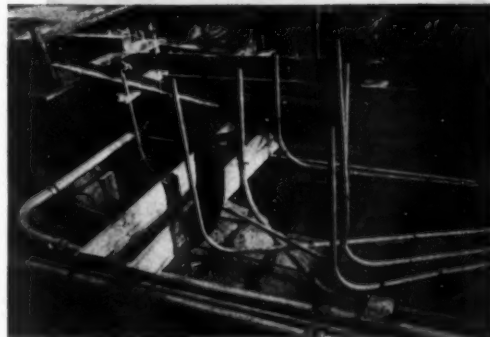
1. Because this modern threadless conduit is made of tough, strong open-hearth steel that withstands abuse.
2. Because it is uniformly galvanized — resists corrosion — lasts for the life of the installation.
3. Because it is easy to handle and install — saves back-breaking labor.
4. Because threadless compression fittings eliminate necessity of either turning the line or the use of running threads.
5. Because there are no threads required in a run of ELECTRUNITE Steeltubes, complete continuity of galvanized surface is assured.
6. Because wires are readily pulled.

For wiring in heavy machine foundations (as illustrated on these pages) or any other kind of industrial application, you'll benefit by using ELECTRUNITE Steeltubes for both exposed and concrete work. Use it for your next job. Let it prove its ability and thrift to your entire satisfaction.

## Steel and Tubes Division

REPUBLIC STEEL CORPORATION

CLEVELAND . . . . OHIO



Highly ductile, ELECTRUNITE Steeltubes is easy to bend to any shape. Short kicks and offsets needed to fit into reinforcing networks are readily made on the job.

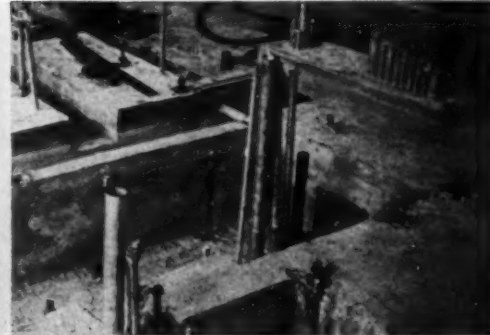


Easy-to-install compression-type couplings make positive, water-tight joints that will not loosen under vibration. Grout cannot seep in at joints.



At left: — ELECTRUNITE Steeltubes is available in a full range of sizes from  $\frac{3}{8}$ -inch to 2-inch. See National Electrical Code for approval.

At right: — Smooth joints and the patented knurled inside finish in ELECTRUNITE Steeltubes materially reduce wiring effort. Bent stubs are easily straightened, without damage.



# Greenlee TOOLS

TIMESAVERS and PROFIT-MAKERS FOR THE CONTRACTOR



## Conduit Benders

Greenlee Hydraulic Conduit and Pipe Benders are timesavers, because they bend faster than by other hand methods. In addition, they make smooth, even bends, making it easy to pull in wire and cable.

## Knockout Tools

Greenlee Punches and Cutters make it easy to enlarge holes in switch boxes, cabinets, etc. They form clean-cut holes quickly and accurately, without reaming or filing.



Our new Catalog, No. 31E, illustrates and describes these tools, as well as many others of interest. If you do not have a copy, send for one now.

**GREENLEE TOOL CO.**  
ROCKFORD ILLINOIS

GREENLEE TOOL CO., Rockford, Illinois

Would like information on: .....

☐ Please send Catalog No. 31E.

Name .....

Street .....

City and State .....

My Jobber is.....ECI-40

## Magnetic Control and Safety

Extensive use of magnetic starting equipment with motors has many advantages over the manual type. But it has introduced hazards that are frequently overlooked. When using manually operated starters the motor does not start unless the motor-circuit switch is closed. On magnetic starters, however, this is not always true. In the control circuit of such an installation, there is used generally a start-stop pushbutton, or often a switch to close the control circuit and one or more interrupting devices, such as pressure or vacuum switches, float, track or limit switches used to obtain a certain operation or sequence. Any one of these devices introduces a possibility of starting the motor without warning, and the greater the number of such switches, the greater is the hazard.

Lockout levers on the "stop" buttons under perfect conditions may give an element of safety. But perfect conditions are by no means assured at all times. If a ground develops anywhere on the distribution system, the possibility of trouble is immediately present. As an example, consider the circuits of the most common magnetic starter with a start-stop button, as shown in the sketch. Suppose a ground develops in the No. 2 control wire between the "stop" button and the starter, and a ground is present or later develops anywhere on the distribution system on

either phase "A" or "C". The control circuit would be completed through ground, and the contactor would close. Nor would the contactor open unless the grounds were removed or the motor disconnecting switch was opened. For this reason lockout buttons are dangerous, especially when installed to provide safety to workmen, since they give a false sense of security. Repairmen or others who go about their duties on or in such "protected" equipment will be taking their lives in their hands. A break down in insulation of the control wiring or at the pushbutton or other control device also presents possibilities of the magnetic contactor closing unexpectedly.

Safety is found only by opening the fused or other disconnecting switch ahead of the motor and locking it open. Where this switch is some distance away, an unfused disconnecting switch in the motor circuit at a more convenient location may be preferable. On a large motor, such a disconnect switch should have an extra blade or other means to hold open the motor control circuit so that the magnetic starter can not be closed when the disconnect is open. This arrangement guards against applying full voltage to the motor when closing the disconnecting switch.

Other cases where grounds may become dangerous are where automatic operation is obtained on pumps with pressure cutouts, or on elevators, hoists, conveyors and other apparatus whose travel is protected with limit switches or the like. Here in a similar way,



**RIDING HIGH** to weld five steel plates in fabricating a 180-in., 70-ton flywheel for Inland Steel Co. Purpose of flywheel is to equalize the load on a 6,000-kw. motor-generator set which supplies power to a reversing motor on the blooming mill. The flywheel acts to keep power consumption from the line within variations of less than 25 per cent, although the load on the blooming mill motor will vary 200 per cent. (Westinghouse photo.)

# "3C" ROLL GRINDER CONTROL



**E**XTREME accuracy and mirror-like finish are essential requirements in Roll Grinding, and the many installations of "3C" Roll Grinder Control throughout the country are active operating testimonials to the efficacy of "3C" apparatus.

Six direct current motors are required to operate this roll grinder. The Wheel-head motor is 25/30 H. P. variable speed, the Headstock motor is 5/7½ H. P. variable speed, Table Traverse motor is 3 H. P. variable speed, while the 1½ H. P. Cross Feed motor, ¾ H. P. Coolant motor, and the ½ H. P. Oil Pump Motor are constant speed — all with "3C" Control.

Clark "3C" Control is helping to obtain the high accuracy and smooth finish which is required of the work done by this roll grinder.

CONTINUE TO ROLL WITH CLARK CONTROL



**THE CLARK CONTROLLER CO.**



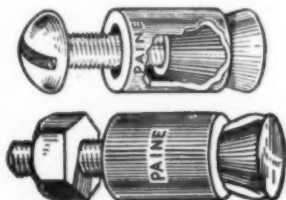
1146 EAST 152<sup>ND</sup> ST.

CLEVELAND, OHIO

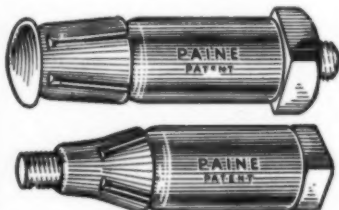
# Paine ANCHORS

## for Dependability

To insure dependable, permanently secure anchorage in all walls, floors or materials standardize on PAINE ANCHORS. Improved design built on extensive tests under all working conditions, give PAINE ANCHORS far greater holding strength—a wide safety factor you can rely on.



**PAINE LEAD ANCHORS.** These are the safest anchors for fragile materials, yet are equally effective in brick, stone, marble, etc. Their ease and simplicity of installation and permanent dependability save far more than the original cost. Embodying strong rustless cone and a specially developed lead-mix, they have by test as much as three times the holding strength of anchors of similar appearance.



**PAINE STEEL EXPANSION ANCHORS** fasten anything securely in concrete, brick, tile, slate, marble and stone.

Having the largest gripping area of any expansion anchor, they hold firmly to the hole walls making them equally effective in bottomless or exact depth holes. May be used repeatedly with same security by bending jaws back to original position.

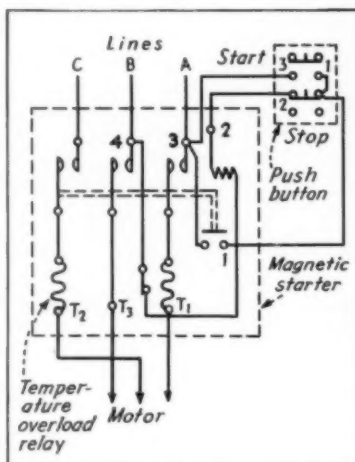
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PAINE  
Catalog  
TODAY!



**THE PAINE COMPANY**  
2961 Carroll Ave. Chicago, U.S.A.  
Eastern Warehouse & Sales: 48 Warren St., N. Y.

grounds can defeat the purpose of the protective or limiting devices. And the ground need not be very heavy, for once the magnetic starter is closed, a slight leakage is frequently sufficient to hold it closed, even after the protective device may have opened.

To reduce the possibilities of such trouble to a minimum, lamps or other ground detectors installed on each separate distribution system give immediate warning of potential trouble. By finding and clearing the ground, greater safety can be assured and maintenance costs materially reduced. A ground on one phase of a starter, for instance, will be unknown in most cases without a ground detector, and may exist for a long period of time. But if a ground



CONNECTIONS for a magnetic starter and start-stop pushbutton.

develops on a motor or some other piece of equipment on an opposite phase then a real repair job has developed, and two or more pieces of equipment are liable to be down.

Where it is imperative that a motor stop when the machine builds up a certain pressure or reaches a point of travel, greater assurance of operation can be obtained by isolating the control circuit from the rest of the system by a small control transformer. If the system voltage is 440, then a four to one transformer will isolate the control circuit, besides reducing the voltage to a less troublesome value. If the motor operates on 110 volts, then a one-to-one transformer will answer the purpose.

### Protection Against Oil Fires

In the event of leakage of inflammable oil from any of the main power transformers, and to confine the oil to the substation area, Caterpillar Tractor Co., Peoria, constructed a shallow tile

*For Better Service -*

**INSTALL TRICO**

**RENEWABLE FUSES**  
With the famous Powder-Packed Element

**KLIPOK CLAMPS**  
Lock fuses and clips together

**KANTARK FUSES**  
With genuine fibre tubes (not paper)

**COLORTOP PLUG FUSES**  
The color tells the size

**FUSE PULLERS**  
Pull and replace fuses safely

**GLASS OILERS**  
For motors, line shafts, solid bearings etc

**UNBREAKABLE OILERS**  
"Opto-Matic" Constant level type  
Gravity Feed type

**WRITE FOR FOLDER CPF-300**

**TRICO FUSE MFG. CO., Milwaukee, Wis.**  
In Canada: IRVING SMITH LIMITED, Montreal

### NOW AVAILABLE IN TWO MODELS



### BEAVER MODEL-C

For those who do not wish the pipe vise we now offer the Model C-1 Power Unit. It is 37 pounds lighter than Model C-2 shown at the right—without sacrificing power, speed, performance or durability.

Both machines make electric power machines of hand tools from 1/4 to 8-inch.

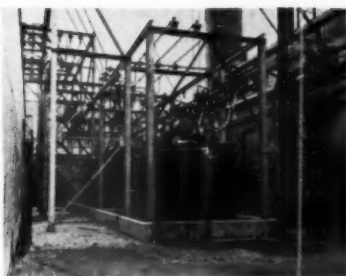
Model C-1 without vise is  
**\$125.00**

Model C-2, with vise, is  
**\$131.00**

Write for new catalog  
just off the press.

**Beaver Pipe Tools, Inc.**  
140 Deen Ave. Warren, O.





**THREE-SECTION WELL** for main substation confines transformer oil to the immediate area.

well around each of three 5,000-kva. transformer banks. Each bank consists of three 1,666-kva. transformers.

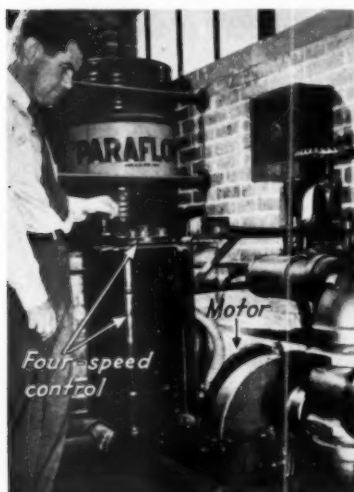
The well has two partitions, dividing it into three sections. Each section is 16-in. deep, 11-ft. wide and 24-ft. long and capable of holding all the oil from the respective transformer bank.

Thus if fire originates at one of the transformers, adjacent buildings are protected. Flaming oil cannot pass from one portion of the well to the next, but is confined to the area of the bank where trouble started.

Power is supplied at 13,200 volts to the main substation, and stepped down to 4,000 volts for distribution throughout the plant. Transformer banks located near load centers furnish 440-volt service for plant machines.

### Four-Speed Motor Solves Cold-Weather Pumping

In warm weather heavy oil (SAE 70) can be drawn satisfactorily from outdoor storage tanks by a pump having a capacity of 75 g.p.m. at 1,750 r.p.m. But in cold weather the oil



**FOUR-SPEED MOTOR** drives pump at suitable speeds, depending on the temperature of heavy oil.

## When You Need An Electric Motor Bearing

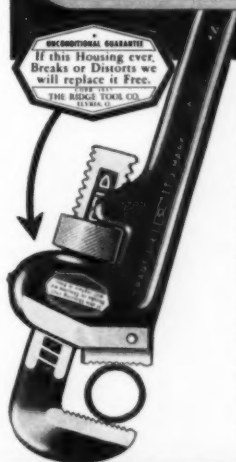


● You can procure instantly a completely finished Bunting Bearing for any make of electric motor from 1/50 hp to 100 hp from your Electric Supply Wholesaler or any Bunting Warehouse. Also available from stock are Bunting Standardized Bronze Bearings for all mechanical applications and Bunting Precision Bronze Tubular and Solid Bars... The Bunting Brass & Bronze Company, Toledo, Ohio. Warehouses in All Principal Cities.

**BUNTING**  
BRONZE BEARINGS • BEARINGS  
PRECISION BRONZE BARS • HARDY METALS

WRITE FOR CATALOG WHICH  
MAKES SELECTION EASY

Yep... you sure can  
cut your wrench expense  
with this Guaranteed  
**RIDGE**



**M**ILLIONS of users have learned how that housing guarantee adds to the life of a wrench, keeps it at work, stops time-out for repairs, cuts your investment in spare parts. You get the same expense-saving with this modern all-alloy wrench, with replaceable safe chrome-molybdenum jaws that grip and let-go instantly. You actually enjoy the adjusting nut that spins easily in all sizes, 6" to 60" —and the comfort-grip I-beam handle. And mind you, it costs no more than other top grade wrenches it far outworks. Save money — buy **RIDGE** at your Supply House... today!

THE RIDGE TOOL CO. • ELYRIA, OHIO

**RIDGE PIPE TOOLS**

**Easy to  
INSTALL**



## JOHNSON ELECTRIC MOTOR BEARINGS

### Distributors Wanted

If you sell Electrical Supplies, investigate the profit possibilities in Johnson Electric Motor Bearings—No obligation.

• You eliminate expensive machining, costly delays when you install Johnson Electric Motor Bearings. Each bearing in this complete line comes to you ready for immediate installation. All oil grooves, slots, holes are correctly installed. You simply slip the bearing into the housing or over the shaft—and you are ready to go. Johnson Bearings are cast in a special high lead bronze to insure the maximum performance. This eliminates frequent replacement. Write for our complete catalogue—Today.



## JOHNSON BRONZE

*Sleeve BEARING HEADQUARTERS*

490 S. MILL STREET • NEW CASTLE, PA.

**Don't Spend Hours  
Chiseling Holes  
in Concrete!**



**DRILL HOLES  
50-75% FASTER!**

Amazing new drill-point contains special metal harder than hardest steel. Goes through concrete, tile, slate, porcelain, etc., 50 to 75% faster. Drills cleaner, more accurate holes. Speeds up installation of expansion anchors. Saves your skilled time for more profitable work. Eliminates noisy hammering, monotonous chiseling. Doesn't splinter fragile work. No special equipment needed—use in any rotary drill. Get your share of those extra profits now possible. Send coupon for leaflet.

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**CARBOLEY**  
MASONRY DRILL-POINTS



### The SIMPLE METHOD saves time makes neater jobs

Neater jobs—more time for more jobs means more earnings—that's what B-M Connectors and Couplings (cadmium finish) mean to progressive contractors who want safe, good looking connections. B-M Indenter is the only tool required and we limit the use of our tools and method (under patent) to the installation of our fittings only. See your Wholesaler or write distributor nearest you for more information.

**BRIEGL  
METHOD TOOL CO.**  
(NOT INC.)  
GALVA, ILLINOIS

Distributed by:  
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National Enameling & Mfg. Co.  
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Triangle Conduit Cable Co.  
Elmhurst, New York City

flows very slowly, at approximately 15 g.p.m., and a strain is put on the high-speed pump when a "piece" of cold heavy oil enters.

The Security Oil Co. of Wichita, Kan. avoids the shock to the pump by driving it at 600 r.p.m. A 4½-hp., 1800/1200/900/600 r.p.m. squirrel-cage motor is used, controlled by a pole-changing drum switch, magnetic primary switch and start-and-stop push-button. With this arrangement the four-speed motor operates the pump at speeds suitable for the flow of oil at any temperature. In addition, the slow-speed operation eliminates the necessity of heating the oil in winter and this in turn avoids color changes in the oil.

### Space Under Transformers

By installing all-metal weatherproof switch houses under transformer platforms, Caterpillar Tractor Co., Peoria, has utilized space and centralized 4,000/440-volt, three-phase power distribution equipment for respective load centers. How space was used is shown in the illustration.

At the foundry the transformer bank consists of three 333-kva. and three



*SPACE is effectively used by locating switch houses under transformer platform.*

200-kva. transformers for supplying power, and one 200-kva. transformer to supply light. Directly underneath the platform the switch houses were located. These switches control the 440-volt, three-phase circuits serving the foundry.



***"Look! He fixed the relay to shut off the current  
when his toast is just right!"***

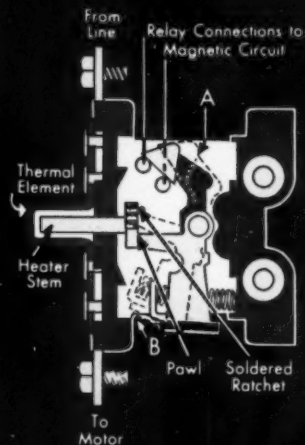


Bulletin 709  
Solenoid Starter

Whether it's for toast or motors, you can get reliable protection with the accurate overload relays in Allen-Bradley solenoid starters. When equipped with properly selected heater elements, these relays disconnect the motor on sustained overloads, before it becomes dangerously overheated. They always trip at the same point, regardless of how often they may be operated.

Allen-Bradley solenoid starters also have double break, patented silver alloy contacts that never need filing or cleaning. The simple switch mechanism has no trouble-causing bearings, pivots, pins, or complicated mechanisms. Specify these starters on your next tough job.

#### How the Overload Relays in Allen-Bradley Starters Operate to Protect Your Motors



Motor current flows through the thermal element and heats a ratchet soldered to a heater stem. At sustained overloads, the solder melts, releasing the ratchet and allowing a spring-operated pawl to open the relay contacts as shown at "A." The eutectic solder that is used has an accuracy of plus or minus one degree in its melting point. That's why it will always trip at the same point.

After a minute or two the solder hardens. Pressing the "Reset" button on the cabinet recloses the relay.

# ALLEN-BRADLEY

## SOLENOID MOTOR CONTROL

QUALITY





# A New Line of CONTROL STATIONS



—restyled for new beauty

—redesigned for longer life and more convenient installation

Here is a revolutionary new line of push-button control stations—new in exterior appearance and new in interior design. With their molded bakelite covers and polished diecast bases, these stations will add to the appearance of any job. And the mechanism is of the unit construction, to make installation easier. Double break, cadmium silver alloy contacts assure trouble-free life. Investigate these new type standard-duty control stations.

Allen-Bradley Company  
1307 S. First Street, Milwaukee, Wis.

## Bulletin 800

Mechanism is exposed on front and sides for easy wiring



No danger of grounds with molded plastic cover



Dust is kept out by tongue and groove

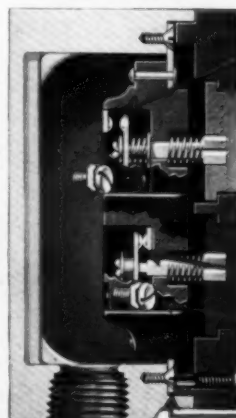
Mechanism can be removed as a self-contained unit

Buttons can be turned 90° for horizontal mounting

## A WINNER in Fifth Annual Electrical Manufacturing PRODUCT DESIGN CONTEST

A paper describing the development of the new Bulletin 800 Push-Button Station was given one of the four awards in the Fifth Annual Electrical Manufacturing Product Design Contest. Only a design that represented an entirely new approach could have attained this coveted honor.

Send for Reprint of AWARD PAPER



Double break, silver alloy contacts assure reliable operation

Button has flange seal

"Start" button is flush and cannot be operated accidentally

Large 1" buttons for easy operation

No danger of shorting contacts

Terminals conveniently located

Easy to mount in machine bases  
Requires no backing plate

# ALLEN-BRADLEY

## MOTOR CONTROL

QUALITY





# Estimating

## UNDERGROUND AIRPORT CABLES

Lighting an airport near Omaha, Neb., the Sterling Electric Co., electrical contractors of Omaha, buried several miles of two conductor No. 8 high tension cable 18 inches below the surface of the field.

The job required 18,000 ft. of trenching in clay soil under relatively ideal conditions. There were no rocks, roads, or other obstructions to contend with.

With a tractor and plow the sod was broken and lifted clear. Another run with the plow opened the trench to the required depth. The trench was then hand cleaned and cable laid with a tractor and a jack trailer.

The trench was roughly back filled with a scraper, sodded and finished by hand.

The average cost for 18,000 ft. of ditch—.08 per foot.

Average cost for laying cable—.01 per foot.

## FLEXIBLE BUS DUCT COSTS

The electrical distribution system of one floor of a five story manufacturing plant was recently modernized. The room was to be used as a machine shop with a present connected load of 14 motors ranging from  $\frac{1}{2}$  to 3 hp.

The old distribution tapped on open busses, on the ceiling of the floor below, and fused at this point. Circuits ran along this ceiling and up through the floor to the motor on the machine. Under the new method a line of flexible bus duct was suspended from the ceiling down the center of the room. This duct was tied into the open busses below the floor, with four No. 4/0 r.c. cables in  $2\frac{1}{2}$  inch conduit. Each cable was protected by a 200 ampere fused disconnect switch mounted on one of the columns. A three phase, four wire 120/208 volt system was used. Individual machine lights were taken from the same circuit as the

motor circuit. All bus duct and fuse plugs, mounted on the duct at each branch circuit, were three phase, four wire. Conduit extensions from the fuse plugs to the individual machines averaged 15 feet in length.

The building was constructed with concrete walls, and re-enforced concrete floors with steel beams. The ceiling height was 11 feet. All conduit and duct were mounted on concrete. The contractor, who made the installation, kept an accurate record of the labor for future reference.

The material installed included the following:

- 50 feet— $2\frac{1}{2}$  in. galvanized conduit.
- 4— $2\frac{1}{2}$  in. conduit elbows.
- 225 feet—No. 4/0 r. c. cable.
- 50 feet—225 ampere, 3 phase, 4 wire, 120/208 volt flexible bus duct.
- 14—30-60 ampere 3 phase, 4 wire fuse plugs.
- 11—bus duct angle iron supports made up on the job.
- 1—200 ampere, 3 phase, 4 wire, S.N., 120/208 volt disconnect switch.
- 200 feet—galvanized conduit for drops from duct to each machine.
- 1200 feet—No. 12 r. c. wire.
- 100 feet— $\frac{1}{2}$ -inch conduit.
- 7—duplex single phase, 3 wire grounded power receptacles on 4-inch round boxes.



**CONTRACTOR ALTERNATE** on the Electrical Committee, which decides on revisions to the National Electrical Code. W. L. Fowler of Cedar Rapids, says too many wiring systems run up the cost of wiring by requiring distributors, wholesalers, contractors to stock too many items. And, concentration on fewer systems would permit wiremen to develop greater skill.

The labor distribution for the complete installation was:

**CUTTING HOLE** in 6 inch re-enforced concrete floor for a  $2\frac{1}{2}$ -inch conduit.

Total time ..... 2 m.h.

**MOUNTING CONDUIT**—includes cutting, threading and strapping to concrete 50 feet of  $2\frac{1}{2}$ -inch conduit and four elbows.

Total time ..... 10 m.h.

Average time per foot..... 0.20 m.h.

**MOUNTING DISCONNECT SWITCH**—includes mounting and connecting a 200-ampere, 4-pole, S.N. disconnect switch on a concrete column.

Total time ..... 2 m.h.

**PULLING WIRE** consisting of four No. 4/0 r.c. cables in  $2\frac{1}{2}$ -inch conduit. Includes connections to the bus duct with solderless lugs.

Total time ..... 3 m.h.

**TAPPING BUSSES**—includes connecting and taping four No. 4/0 r.c. cables to four "hot" busses with solderless connectors.

Total time ..... 3 m.h.

Average time per tap..... 0.75 m.h.

**FABRICATING HANGERS**—includes cutting, punching holes and assembling 11 angle iron hangers. Each hanger consists of two pieces of iron, one 12 inches and the other 30 inches long. Each piece has three holes in it. The hangers are assembled in "T" fashion, the 12-inch side being clamped to the duct.

Total time ..... 4 m.h.

Average time per hanger..... 0.364 m.h.

**DRILLING CONCRETE FOR HANGERS**—includes drilling 22 holes for  $\frac{1}{2}$ -inch lead anchors and driving in the anchors.

Total time ..... 4 m.h.

Average time per hole..... 0.182 m.h.

**MOUNTING DUCT HANGERS**—includes mounting and aligning the duct hangers.

Total time ..... 8 m.h.

Average time per hanger..... 0.725 m.h.

**MOUNTING DUCT**—includes mounting five 10-foot sections of 225-ampere, 3-phase, 4-wire duct. Each section weighs 103 pounds. The duct ends overlapped each other and were bolted together. The ceiling height was 11 feet. "A" ladder scaffolds were used.

Total time ..... 12 m.h.

Average time per section ..... 2.4 m.h.

Average time per foot..... 0.24 m.h.

**CONNECTING MACHINES**—includes mounting fuse plug on duct, installing conduit and wire to the motor and making all connections. Average length of drop from the duct to motor was about 15 feet.

Total time for 14 machines..... 42 m.h.

Average time per machine..... 3 m.h.

**INSTALLING RECEPTACLES**—includes mounting 100 feet of  $\frac{1}{2}$ -inch conduit, seven 4-inch boxes, pulling in wire and connecting seven duplex, single phase, 3-wire, grounded receptacles.

Total time ..... 9 m.h.

The above labor data does not include non-productive or supervisory labor. From E. J. White Co., Newark, N. J.

# Questions ON THE Code

Answered by  
**F. N. M. SQUIRES**

Chief Inspector New York Board of Fire Underwriters

## Service vs. Circuit Fuses

**Q.** "Will you kindly advise whether the installation of switch and meters, as shown in diagram, is according to the Code. Two inspectors have passed this type of installation, but a third one said it was not in the Code. This installation is in a filling station with single occupancy, using light and power meters."—A.T.McM.



**A.** As the No. 6 mains to the meters and between the meters and the light and power panels are adequately protected by the 50 ampere service fuses, no other fuses ahead of the branch circuit fuses are required unless the service cabinet is sealed or locked. If the service fuses are not readily accessible, because of being sealed or locked, fuses are required by Section 2373 at points A and B.

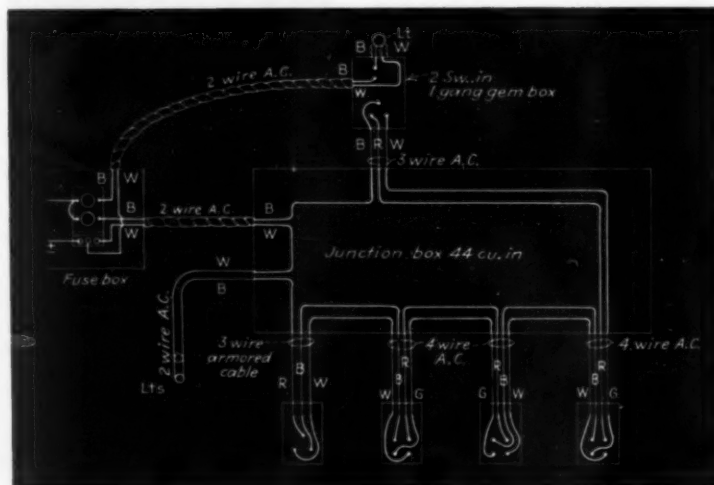
## High Voltage Line

**Q.** "A 2300 volt line is dead-ended in a farm yard. The transformer is located on the last pole and the customer wanted a yard light installed on this same pole. The power company line foreman said this was all right. Putting the light where the customer wanted it placed the reflector within a foot of one of the 2300 volt weather-proof insulated wires leading to the transformer. A grounded meter loop conduit is within reach of the light. Would this location of the light be regarded as dangerous and would it pass the Code?"—G.K.B.

**A.** This problem is none too well covered in the Code. Section 2387f requires that the open wires of services at over 600 volts be guarded where accessible to unqualified persons. As the light on the pole has to be relamped at intervals and as this would be done by unqualified persons, the 1 foot separation between this light and the 2300 volt wires does not seem sufficient. Application of section 7163, dealing with the guarding of the wires of systems of over 600 volts at working spaces, would lead to the application of the distance specified in Table 21, which for 2300 volts is 3 feet 3 inches.

## Identified Connections

**Q.** "Will you please get a ruling for me on these Code problems? I wish to control a set of lights from five points, making the connections in a centrally located distribution box, as shown on the sketch below. Does the sketch indicate the correct colors? "If the fuse box were oversize, could



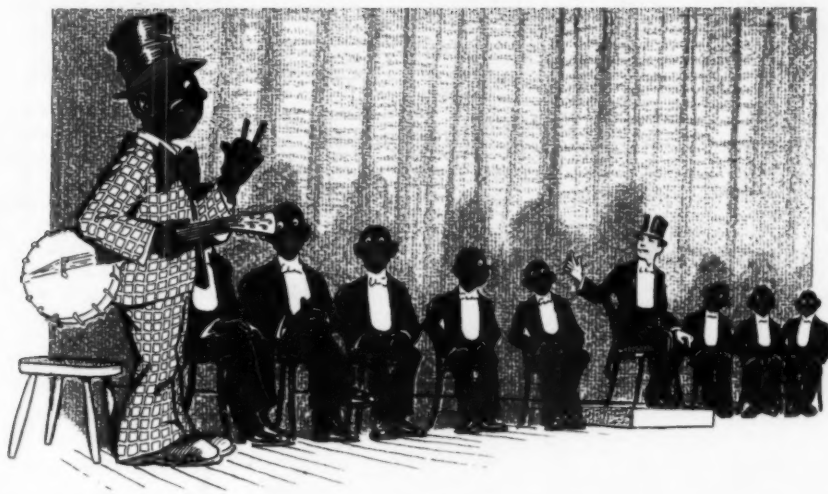
the splices be made therein instead of in a separate distribution box? And is it permissible to install a two-switch single gang switch unit in a Gem box with built-in BX clamps, when a total of seven No. 14 conductors enter such a box?"—E.R.E.

**A.** The color coding shown in the question is satisfactory and complies with Section 2006b. As there are twenty-two wires entering the junction box the size of 44 cubic inches is required. If the fuse box had been large enough so as to provide an available 44 cubic inches of gutter space in which to make the splices, they could be made there.

But in the single gem switch box there is not sufficient room to satisfy section 3705. The seven wires entering this box require 14 cubic inches besides the space taken up by the two switches, not to mention the armored cable clamps. The box itself with out anything in it, contains 13 cubic inches. A larger box should therefore be used.

## Type RW Wire

**Q.** "I am writing you for your opinion regarding Section 3036—Types of Conductors for Moist Locations. Under this section, it states that conductors shall be lead-covered or of other type specially approved for the conditions, if installed in any of the following locations, A. Underground. B. In concrete slabs or other masonry in direct contact with earth, etc. On page 329 of the May 1939 issue of the List of Inspected Electrical Equipment by the Underwriters' Laboratories, Inc. under Rubber Covered Wire it states that R.W. indicates a single conductor having a low-moisture absorp-



INTERLOCUTOR:—"Mr. Bones . . . NOW what are you all so hot and bothered about?"

MR. BONES:—"Wel', Mr. 'Lockuter, 'spose you was a 'lectrical contractor wirin' buildings an' such. Yo needs wiah, pipe, connectahs, couplins, boxes an' all . . . an' dey aint all made in yo back yard . . . dey comes fr'm all ovah dis heah country."

INTERLOCUTOR:—"So what? Can't you get them direct from the manufacturers?"

MR. BONES:—"No suh: ma jobs is all rush jobs. Does you 'spect me to write a lettah to all dem 'facturers and tell him what Ah wants and fo' dem to write de tickets, pack de stuff, ship it and bill it and trust me t' pay fo' it? No suh, It don' mak' sense.

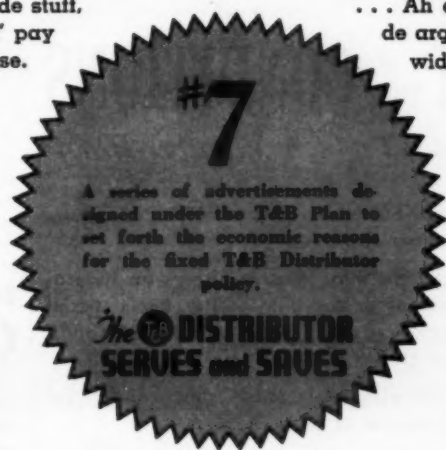
Ah'd have to pay fo' all dose details, an' dey sho' is 'spensive operations. Ah'd be jus' one of thousands accounts an' no one gonna worry ver' much 'bout dis heah little contractor!"

INTERLOCUTOR:—"Well, if it weren't for the rush, couldn't you save money buying direct from the manufacturer?"

MR. BONES:—"No suh— Ah goes to de T&B Distributor. He got everythin' Ah needs. He got thousands of 'lectrical things all in one place an Ah can get 'em when Ah need 'em. He does mos' all de work fo' de 'facturers and dat saves me cash . . . Ah could go on, an on, but Ah wins de argment right heah . . . le's get on wid de show!"



The T & B Distributor assumes responsibility for the materials he sells. He gives preference to standard, trademarked products. They carry his stamp of approval as well as the Manufacturer's guarantee.



By spreading the cost of distribution over many lines the T & B Distributor reduces the Manufacturer's operating, warehousing and selling costs. The User, therefore, gets quality products at minimum cost.



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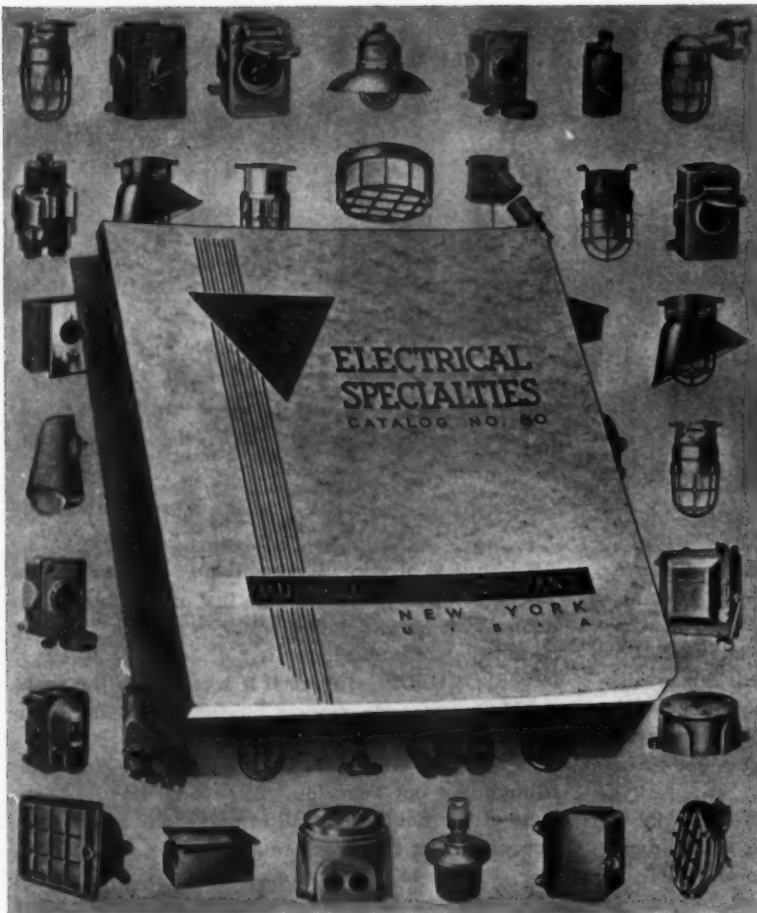
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[FROM PAGE 52]

tive rubber insulation and a fibrous covering, but no lead covering suitable for use in locations where exposed to moisture.

"I would like to know if this type R.W. wire is approved for all locations covered under Section 3035 of the Code. If R.W. Wire is approved for all locations stated under this Section (3035) should the conduit size be figured under table 2 of Chapter 9 rubber covered conductors? Or should the conduit size be figured under Table 4, Chapter 9, on lead covered conductor in conduit or tubing?—E.E.L.

**A.** The type RW wire, which is listed by Underwriters' Laboratories as suitable for use in moist locations without lead, may be used anywhere in place of lead covered wire. For limitations on conduit fill the table pertaining to type R wire should be used, inasmuch, as this type RW wire has the same overall dimensions as the type R building wire.

### Running Threads

**Q.** "Article 3470 of the Code states that running threads shall not be used on conduit. Does this mean in concrete only or everywhere? I see them used every day by many contractors and would like to have this cleared up for me."—L.P.A.

**A.** Article 346 and Section 3470 deal with conduit in general and the final sentence in paragraph 3470 means that running threads on conduit are taboo anywhere and everywhere whether in concrete or not.

### Grounding Switch Box

**Q.** "Will appreciate getting your interpretation with regard to the grounding of a box enclosing disconnect which is placed on the building within reach of the ground. This switch is supplied by a non-metallic wiring system with a voltage of less than 150 to ground. I am confused on the above between articles 2514b and 3812"—B.D.

**A.** Neither Section 2514 nor Section 3812 requires the grounding of the enclosure of a disconnect (not a service) switch located on the outside of a building within reach of the ground, when the wiring system is non-metallic sheathed and the voltage to ground is not over 150.



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...promises bigger and better business in the Electrical Contracting Industry . . . . . General Cable wires and cables will play a prominent part in this forward movement . . .

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1934

1935

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*Electrical Contracting, January 1940.*

55

# In the News

## ELECTRICAL COMMITTEE NFPA APPROVES THIN INSULATION

Thin wall insulation conductors were approved under the Code by the NFPA Electrical Committee at its meeting in Atlantic City the week of Dec. 4. The other seven proposals, for which the power companies have been campaigning through the past year, were not approved. The committee reviewed the 1940 revision of the National Electric Code in a protracted meeting. The sessions passed in detail on the recommendations of the numerous "article committees" that, throughout the past year, have been working out changes in the Code in preparation for the new edition now to be issued.

Some 49 members and about an equal number of alternates gathered at Haddon Hall over the weekend. Beginning Monday morning, they laboriously discussed and voted on the recommended revisions presented in the 118 page preprint. Morning and afternoon sessions continued through Friday and three night sessions were held.

The review of "Article 300" was the

high spot of the week, because it embraced the controversial issues involved in the power company recommendations. This was reached on Wednesday afternoon with the consideration of thin wall insulation. This new product is designed to increase the circuit capacity of commercial buildings by pulling more wires or larger copper into existing conduits, without defacing walls.

Type RH grade 75° heat resistant rubber insulation, 1/32 inch thick, was approved for sizes No. 14, 12 and 10 conductors and No. 8 wire with 3/64 inch wall thickness for general use. Latex insulation of 18/1000ths inch thickness was approved, with a 60 degree temperature limit, for sizes 14, 12 and 10, restricted for rewiring for increased load, where space is not available in raceways for conductors of thicker insulation, and where it is impractical to increase the size of raceways.

"Conductors having an approved solid synthetic insulation" were approved for rewiring, with 60 degree temperature limitation, using 2/64ths of insulation on No. 14, 12 and 10 and 3/64ths on No. 8 and 4/64ths on No. 6 to 2 and 5/64ths for No.

1 to 0000. Latex and synthetic wire may be used under special permission on knob and tube and open wiring or "generally for rewiring for increased loads."

Cellular floors were approved Wednesday night, for use as raceways for electrical conductors. The NEMA spokesman tried to block approval by urging that wires must be in armored cable or non-metallic sheath cable. But the weight of EEI and inspector votes carried it.

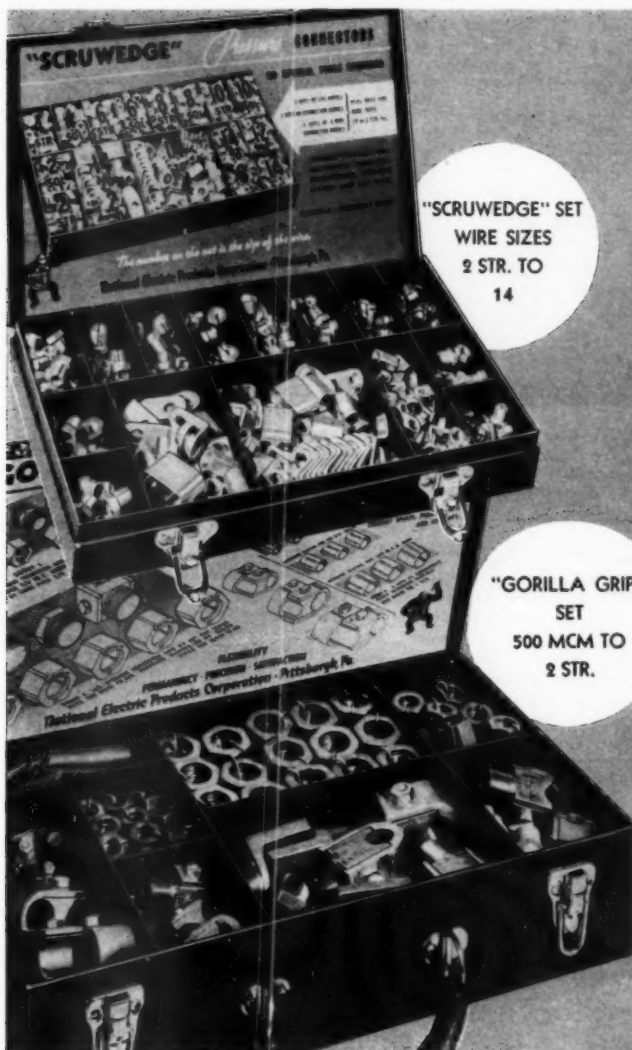
"CNX" covered neutral cable was debated Thursday morning and lost by the narrow margin of two votes. Despite the solid support of the power companies, electrical manufacturers and stock insurance companies, the necessary two thirds vote could not be secured. The five newly appointed members of the United States Conference of Mayors voted against it or the approval would have been given.

Whereupon O. K. Coleman, for the power group, made an appeal for "bare neutral", urging its need in the rewiring of commercial buildings. But Dr. M. G. Lloyd, representing the U. S. Bureau of Standards, pointed out that the newly approved thin insulation may be used for feeders as well as circuits. H. S. Warren, representing the American Water Works Association, urged that action on bare neutral await the report of the present joint survey on grounding and the proposal was downed. Only the power companies voted for it.

The permissible conduit fill, with thin wall insulation, was set at 40 per cent for two wires and 50 per cent for three or more wires. This represents a 25 per cent increase. The power company proposals that armored cable and non-metallic sheath cable be used in theatres and motion picture studios and open wiring and knob and tube be approved in commercial garages and hazardous locations were voted down.



**MAKING OUR CODE**—The NFPA Electrical Committee in session at Haddon Hall, Atlantic City, the week of Dec. 4th, where 49 members and as many alternates labored five days and three evenings passing on Code revisions recommended by Article Committees. Alternates serve on committees and discuss but do not vote.



"SCRUWEDGE" SET  
WIRE SIZES  
2 STR. TO  
14

"GORILLA GRIP"  
SET  
500 MCM TO  
2 STR.

## Assemble PRESSURE CONNECTORS on the Job!

2 SIMPLE KITS OF INTERCHANGEABLE PARTS, MAKE UP CONNECTORS FOR ALL SIZES FROM 14 WIRE TO 500 MCM CABLE.

Here are two sturdily built pressure connector stock sets which will answer your everyday need for mechanical connections.

The Scruwedge set can be easily carried under the arm for the smaller job and contains connections for making straight splices, terminal connections and tap-offs for conductor sizes 14 to 2 stranded inclusive.

The Gorilla Grip set is for the large jobs and is equipped with a strong leather handle for carrying. It contains Lug Bodies, Straight Connector Bodies, Parallel and 90° Cable Tap Bodies, plus Terminal Units and Reducing Sleeves for conductor sizes 500 MCM to 2 stranded inclusive. 125 Combinations are obtainable in this set.

## Simple-Flexible

Gorilla Grip Pressure Connectors have been designed for flexibility (one nut will fit many types of bodies) without sacrificing precision. It takes just a few seconds to select the type of bodies required and assemble with nut which is clearly marked with conductor size and easily identified.

Each wire is gripped over the entire peripheral area of the copper conductor regardless of type of body or size of nut. The grip positively will not loosen and no special tools are required to complete a job.

Write for descriptive literature on this new innovation.



**National Electric Products Corporation**  
Pittsburgh, Pa.



Other interesting changes to be embodied in the coming edition of the Code are—

—Wood moulding and cased-in raceway provisions were deleted.

—A new simplified table of higher current carrying capacities will be provided for grades above Code wire, giving higher wattages per area for number of circuits and feeder sizes, to aid computation.

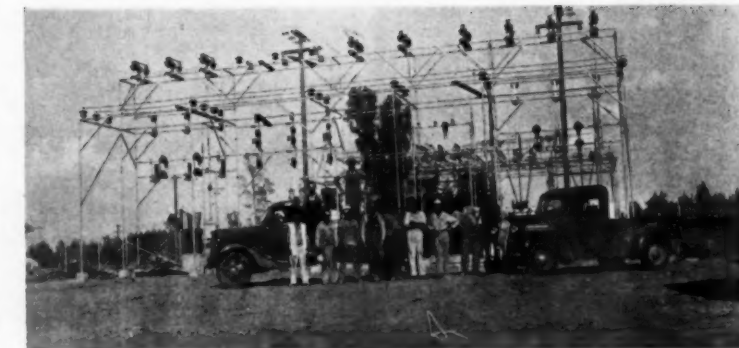
—Non-tamperable fuses will not become mandatory until November 1, 1941. Interchangeability was recommended only.

—A simplified table of temperature limitations was adopted.

—Many features were added to the National Electrical Code to harmonize it with the National Safety Code.

Those who have not attended one of these Electrical Committee meetings can little appreciate the enormous volume of work involved. Approximately a hundred men labored through these many days and nights with meticulous care, voting in or out, the innumerable changes referred for approval by the article committees. The procedure is highly organized and the meeting progresses with surprising dignity and order under the skillful handling of Chairman A. R. Small. Despite the free discussion that sometimes breaks out and consumes long periods of time, the action of the meetings is steady and fast and the committee accomplishes a staggering amount of work.

By an interesting coincidence the action at this meeting on the eight proposals of the power companies followed exactly the



**IN THE DESERT**—One of the desert substations built by H. O. Bauerle, Los Angeles electrical contractor for the Imperial Irrigation District, taking power from the newly completed All-American Canal. Bauerle and his crew built four fully automatic stations, at Holtville, Calexico, Imperial and Calpatria in 60 days.

vote of the survey, conducted by *Electrical Contracting* last summer. In a mail ballot by more than 1,000 contractors, the majority voted to approve thin wall insulation for building wire to permit a larger conduit fill. The majority condemned covered neutral cable, and the use of bare neutral in raceways, and the relaxation of present requirements in garages, theaters and other hazardous occupancies. The action of the committee exactly paralleled this advance reflection of contractor opinion.

## FEDERAL PURGE HITS SAN FRANCISCO

Thurman Arnold's Department of Justice purge of the construction industry struck San Francisco and Oakland on Dec.

18th. Officers of the electrical contractors associations of San Francisco and Alameda and Contra Costa Counties as well as the local IBEW unions and the San Francisco Bid Depository were indicted by the Federal Grand Jury. Four San Francisco electrical contracting firms, three Oakland firms plus a number of individuals, who have been members of the board of directors or committees of these associations, were named and also D. W. Tracy, president of IBEW in Washington.

Charges are voluminous and sweeping. They include violation of the Sherman Anti-Trust Act by conspiring to fix prices, to submit collusive bids, to coerce contractors into the trade associations by depriving them of union labor and to restrict the amount of electrical materials entering the area.

The electrical contractors associations claim that they operate only in intra-state business. They are set up under the fair trade laws of the state of California and under the state anti-trust laws, which permit combinations within limits, as long as the profits are reasonable and conduct is in the public interest. The naming of D. W. Tracy in the indictments is, therefore, taken to indicate an attempt to prove interstate restraint of trade.

The San Francisco firms included in the indictment were H. S. Tittle Company, Frank J. Kilm Company, Enterprise Electric Works and Dicker Electrical Construction Company. The Oakland firms are Scott Buttner Electric Company, Pacific Electric Motor Company and California Electric Company. Thirty individuals of the local electrical contracting industry were also named.

## R L M FLUORESCENT UNIT

The R L M Standards Institute has established a specification for a new 48 inch fluorescent twin-lamp porcelain enamel unit, designed for general illumination, industrial and commercial.

Important features of the specification are: I. Porcelain enamel reflecting surface



"Lady, you gotta make up your mind where you want that light, or we're going back to the shop."





# New **LEVITON**

## **260 LINE OF**

### **TYPE C**

## **TOGGLE SWITCHES**

Here is a new series of switches that can be loaded up to full capacity with ample safety—a durable, high speed, knife action type of mechanism designed for long life under all conditions. Large head 8-32 binding screws for easy wiring, and a sturdy strap, permanently fastened to the housing without screws, makes this switch trouble-free from loosening in service.

Use this new T-Rated line for your heavy Type C lamp loads.

★ Note the raised toggle pad which assures quick wall plate alignment and keeps the toggle free from binding against the wall plate. This pad also protects the switch against dust and improves the appearance.

Cat. No. 260—Single Pole—Rated 10A., 125 V.T  
Cat. No. 261—Three Way—Rated 10A., 125 V.T  
Cat. No. 262—Four Way—Rated 5A., 125 V.T

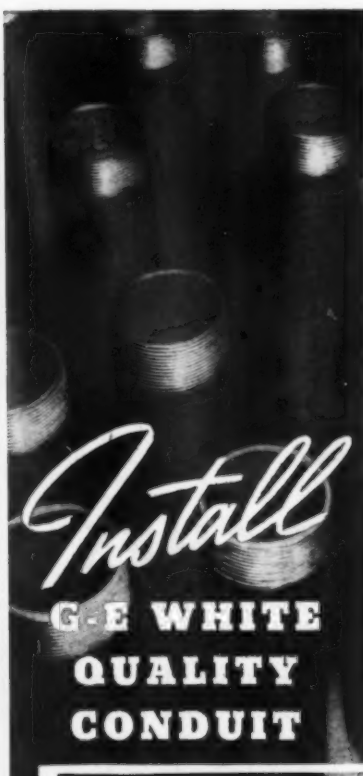
For residential, industrial use, or wherever wiring devices are needed the KWIKCHANGE line fits the job. Each combination can be easily assembled, in any desired scheme—and there are hundreds of combinations to suit all requirements and conditions. Bring your wiring job up to date with KWIKCHANGE.

See this display at your local wholesaler →

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111 N. Canal St., Chicago, Ill. 420 S. San Pedro St., Los Angeles, Calif.





**Install**  
**G-E WHITE**  
**QUALITY**  
**CONDUIT**

G-E White Rigid Conduit will help you to sell wiring jobs. Your customers will like these features:

**Uniformity**—Every length of G-E White Rigid Conduit is like every other length.

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**Durability**—G-E White is resistant to heat, flame, gas, acids, alkalis, moisture and mechanical injury.

Only the finest raw materials are used in the manufacture of G-E White. Rigid specifications are strictly followed. Mild, rimmed steel provides strong welds and makes bending easy. A complete line of boxes and fittings is available.

#### Other Conduit Products

Quality is high also in other G-E Conduit products—Flexible Conduit, Electrical Metallic Tubing, Fiberduct, BX, BraidX, and Service Entrance Cable.

For further information see the nearest G-E Merchandise Distributor or write to Section C-0121, Appliance and Merchandise Department, General Electric Company, Bridgeport, Connecticut.

**GENERAL ELECTRIC**

## In the News

[FROM PAGE 58]

for diffusion and durability; 2. Light output efficiency of 78 per cent; 3. A cut-off angle of 17½ degrees and closed ends to minimize glare; 4. Use of two 48 inch mazda fluorescent lamps correctly spaced to insure a more comfortable and efficient light; 5. A new type approved auxiliary corrected for power factor and flicker; 6. Removable and renewable starting switches located in the socket to facilitate inspection and maintenance.

The units will be available from manufacturers of RLM lighting equipment after January.

### INSPECTORS EXPOSE KANSAS CITY JOBBERS

The Kansas City Electrical Inspection Department, through its Bureau Bulletin, exposes the unethical practices of jobbers in that territory. Some wholesalers, it says, are instructing hardware stores, key shops and handy men in the installation of fluorescent fixtures.

The article points out that electrical installations by other than licensed contractors violates the electrical section of the building code. The Department appeals to the jobbers to put a stop to this habit, which lays the foundation for unfair competition in the contracting business.

### BARE NEUTRAL INSTALLATIONS LISTED

The Edison Electric Institute has listed the names and locations of 141 bare neutral installations in 49 cities in the following nine states. The type of buildings included public utility structures, offices, hospitals, schools, factories, theatres, churches, apartment houses and dwellings. They were distributed as follows:

**Indiana**—55 installations in five cities—one for a public utility.

**Ohio**—24 installations in 12 cities—nine in public utility buildings.

**Michigan**—14 installations in eight cities—nine public utility buildings.

**Kentucky**—21 installations in three cities—three in power company buildings.

**Tennessee**—One power company building.

**West Virginia**—15 installations in eight cities—nine in public utility buildings.

**New York**—Three installations in power company buildings in three cities.

**New Jersey**—Four power company buildings in four cities.

**Pennsylvania**—Four power company installations in four cities.

### SRO AT CHICAGO FLUORESCENT SCHOOL

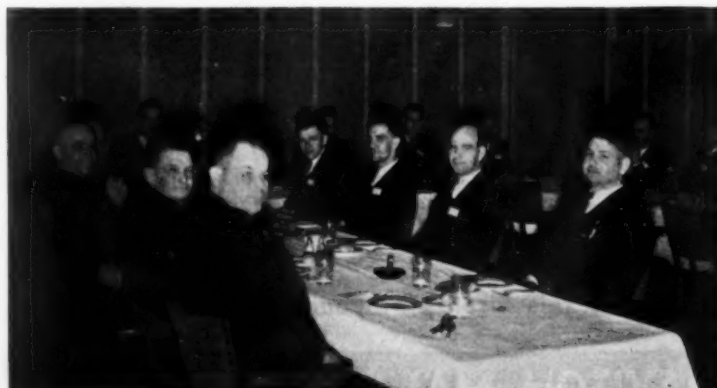
Joe Doakes has been hollering for fluorescent lighting to pretty up his corner cigar store—and getting it. But many contractors are finding themselves short on basic theory, application data and inside dope on what trouble to expect.

So when Curtis Lighting, Inc. opened a series of late afternoon classes on fluorescent lighting for Chicago electrical contractors, the response had the management gasping. The walls bulged with nearly 200 contractors and their salesmen.

The classes started in late November and were held weekly. Each class was devoted to one phase of the subject. A local authority lectured for 30 minutes, then opened the general discussion. Beginning with basic lamp theory the series progressed to lamp construction, control apparatus, reflecting equipment and light application. Classes are scheduled to continue through detailed application methods as long as general interest warrants.

### NEW ORLEANS A/W CONFERENCE

The southern regional adequate wiring conference held in New Orleans December 7 and 8, was attended by 99 industry men who came from ten states.



**MILWAUKEE MAINTENANCE** Engineers organization trekked to Chicago for the annual Chicago EME electrical exhibit. Those who failed to dine before the trip were accommodated on arrival by the Electric Association dining room.



A recent **FA** Busduct Installation was made at the  
U. S. NAVAL TORPEDO STATION  
Newport, R. I.



## 4,000 feet

on one construction job — 2,000 on another — 500 on another!  
These recent installations of



## PLUGIN BUSDUCTS

indicate a growing appreciation — on the part of architects, electrical engineers, contractors and plant engineers — of the convenience, efficiency and economy of this type of distribution.

### The Modern, Compact, Flexible and Efficient Method for Power and Light Distribution

**FA** Plugin Busducts consist of standard 10-foot sections, arranged with nine plugin outlets on 12-inch centers. 2, 3 and 4 wire feeder systems. 250 volt D.C., 575 volt A.C., maximum.

Busducts are made of galvanized steel or aluminum, with proper support for attaching to either walls or ceilings. Flexibility of installation is provided by suitable elbows, tees, end boxes, intermediate feed-in and feed-out boxes — all adapted to fit required space or position. Future extensions may be made readily to existing installations.

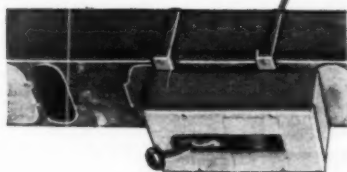
Bus bars are of copper — rigidly supported at 30-inch intervals with insulating blocks that assure proper spacing to meet requirements of the National Electrical Code. Contact surfaces of connecting bars are silver-plated to prevent oxidation.

Send for further information — let us show you how you can use **FA** Plugin Busducts to arrange most effectively the distribution system — economically, easily and according to the latest accepted practice. Frank Adam Electric Company, St. Louis, Mo.



### SHUTLBRAK SAFETY TYPE ENCLOSED SWITCHES

Now in production. For heavy-duty industrial use. High-grade, rugged construction, embodying a new switching principle — the movement of a shuttle in a totally enclosed chamber. When the current is broken, the final arc is taken by specially constructed arcing tips on the reverse side of the clips from where the current is normally carried. . . . Priced no higher.





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- Square-End
- Uniform Dimensions

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DETROIT, MICHIGAN

Don't Let Us  
Just WISH You a  
Prosperous New Year



Let Us Help You  
MAKE It One With  
"AUTOMATIC"  
TIME SWITCHES  
INTERVAL TIMERS  
FLASHERS

Write for Information and Discounts

AUTOMATIC ELECTRIC MFG. CO.  
MANKATO, MINNESOTA

In the News

[FROM PAGE 40]

Detailed discussions, covering every phase of residential wiring promotion were led by Carson E. Hickox, Oklahoma City; J. T. Tuohey, Pine Bluff, Ark.; Harold E. Meade, New Orleans; E. A. Gauthier, San Antonio; E. N. Avegno, New Orleans; Buford H. Martin, Chattanooga and N. E. Tindal, Charlotte. Much practical information was exchanged and gleaned from the experience of these leaders in their own promotions.

O. C. Small, secretary, National Adequate Wiring Bureau, spoke about "The Electrical World of Tomorrow" at the formal luncheon given by the Electrical Association of New Orleans.

The meetings were in charge of W. E. Clement, New Orleans Adequate Wiring Bureau, with W. J. Amoss, New Orleans Public Service and C. L. Osterberger, Louisiana Power & Light Co., acting as co-chairmen.

## COMING MEETINGS

American Institute of Electrical Engineers—Winter convention, New York, Jan. 22-26.

American Society of Heating and Ventilating Engineers—Annual meeting and International Heating and Ventilating Exposition, Lakeside Hall, Cleveland, Ohio, Jan. 22-26.

National Electrical Manufacturers Association—Mid-Winter Conference, Waldorf-Astoria Hotel, New York, Feb. 5-9.

Minnesota Electrical Trade Exposition and Convention Week—St. Paul Hotel, St. Paul, Minn., Feb. 12-15.

Minnesota Electrical Council—St. Paul Hotel, St. Paul, Minn., Feb. 12-15.

National Electrical Manufacturers Association—Spring meeting, The Homestead, Hot Springs, Va., May 12-17.

National Electrical Wholesalers Association—Annual Convention, The Homestead, Hot Springs, Va., May 19-23.

FOR TODAY'S Profitable MOTOR SERVICING  
You need one of these—



"SERVICE  
MIKE"

Where breakdown of electric refrigerators, oil burners—any motor driven equipment—is caused by defective capacitors, capacitor replacement is quicker, and more profitable when you use the new C-D "Service-Mike." With the "Service-Mike" you can easily determine the correct value of capacity required. Moreover, the "Service-Mike" eliminates the necessity of carrying a stock of assorted capacitor sizes on service calls. For greater customer satisfaction and for greater profits, take along the "Service-Mike" on that next service call. Complete with test leads, clips and jumpers ..... net **\$2.25**



"TEST  
MIKE"

Contains same capacitor unit as C-D "Service-Mike", with this time-saving advantage. The "Test-Mike" is capable of instant selection of any TWELVE capacity values from 18.75 mfd. to 150 mfd. Heavy Bakelite case equipped with six toggle switches has real professional appearance. You will find yourself increasingly in demand once you start using the new C-D "Test-Mike". It's today's business-like way to handle motor repairing, and a sure way to increase profits. Complete with test leads, clips and pilot lamp ..... net **\$6.00**

For the complete listing of C-D Replacement Motor Starting Capacitors, send for catalog No. 162. For details on the new C-D "Test and Service Mike" write for Catalog 168A. Use convenient coupon below.

**CORNELL-DUBILIER  
ELECTRIC CORPORATION**

1794 Hamilton Blvd., So. Plainfield, New Jersey

C-D ELECTRIC CORPORATION  
SOUTH PLAINFIELD, N. J.

Rush free catalog No. 162 describing C-D Electrolytic and Dykanol Replacement Motor Starting Capacitors. Also catalog No. 168A on the "Test and Service Mike".

NAME.....

ADDRESS.....

## A/W PROGRESS

### IN 1939

Scores of cities report cooperation with architects and builders in the Adequate Wiring Program during 1939. Intensified promotions tying in all branches of the industry are planned for 1940. The 1939 results for a few of the cities are—

California—2,446 wiring certificates issued during the year.

Roanoke—180 out of 200 new homes adequately wired.

Milwaukee—128 homes certified.

Minneapolis—Value of electrical materials has increased by about \$20 on some 15,000 Minnesota farms.

Denver—Adequate wiring program scheduled for five years.

Youngstown—50 homes certified. Number of outlets added per job for 32 homes was 20.3.

Chicago—Certificates issued to 3,000 homes, including apartment buildings.



You'll sell *Fluorescent Lighting* faster  
when you sell equipment marked  
with this label

NEW FLUORESCENT LIGHT...



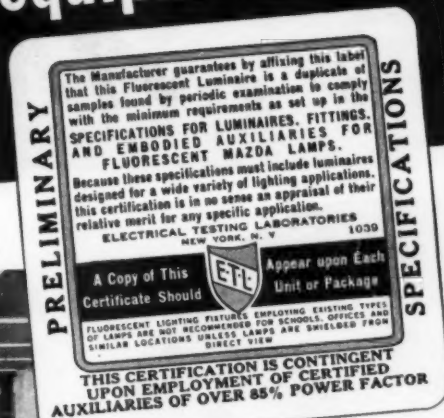
IS LIKE DAYLIGHT



...SPEEDS SEEING



...IS COOLER



THIS LABEL

signifies a product that complies with specifications set up by MAZDA Lamp manufacturers. It indicates a product, samples of which have been checked and approved by Electrical Testing Laboratories. Use it to help you sell.

**Fluorescent Daylighting**, in Certified Fleur-O-Liers is proving to be one of the fastest selling items you ever had!

**Certified Fleur-O-Liers**—lighting equipment certified to give good performance with MAZDA F (fluorescent) Lamps—have uncovered unlimited sales opportunities for you! National advertising, in commercial and industrial publications, tells your customers all about Certified Fleur-O-Liers with MAZDA F Lamps . . . new profits for you.

**For Daylight MAZDA F Lamps**, Certified Fleur-O-Liers, are proving to be a tremendous help to stores, offices and factories . . . for easier seeing, fine assembly, fine production, intricate operation, close inspection and color discrimination. Colored MAZDA F Lamps are developing new decorative opportunities for stores, bars, grills.

#### SELL ADVERTISED AND CERTIFIED FLEUR-O-LIERS

When you sell Fleur-O-Liers, you know that into their design has gone a wealth of intelligent cooperation for the service of the buyer. Write today for a list of Fleur-O-Lier Manufacturers and information on types now available. Fleur-O-Lier Manufacturers, 2116H Keith Building, Cleveland, Ohio.

**FLEUR-O-LIER** *Manufacturers*

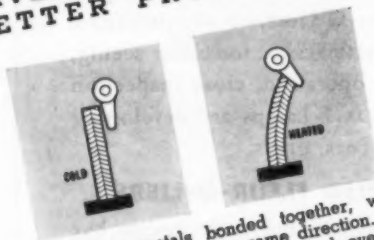
# Get Bi-Metal

## ... AND STOP



SEE HOW  
HEAT BENDS BI-METAL

HERE'S HOW BI-METAL  
SAVES MONEY... GIVES  
BETTER PROTECTION



Two different metals bonded together, when heated always bend in the same direction. The heat from short circuit or continued overload currents causes the Bi-Metal, which is exactly calibrated to the job at the factory, to act and open the circuit. Because of Bi-Metal's characteristics, its accuracy never changes, regardless of the number of operations. There is nothing to replace... there is nothing to wear out.

Ask Your Westinghouse Representative  
for this Bi-Metal Demonstration

MAKE THIS TEST YOURSELF... A strip of Bi-Metal and a match are all you need to prove to yourself the time and money saving advantages of Bi-Metal Protection. Ask your Westinghouse Representative for a Bi-Metal Demonstration Kit.

YOU PAY NO MORE FOR BI-METAL PROTECTION IN THIS WESTINGHOUSE EQUIPMENT



NO-FUSE  
BREAKER

Bi-Metal eliminates fuses. Operates with cabinet closed. Self adjusting overload protection.



LIGHTING AND POWER  
PANELBOARDS

Bi-Metal protects circuits. Eliminates fuses. "De-ion" arc quenchers save contacts. Tamper-proof.



"DE-ION" MOTOR  
WATCHMAN

Manual motor starter for motors up to 7½ Hp. Bi-Metal overload protection. "De-ion" arc quenchers.

# Westinghouse



# Protection

## *MOTOR BURNOUTS*

### ELIMINATE REWIND EXPENSE WITH WESTINGHOUSE THERMOGUARD MOTORS

Rewinds and service calls due to motor burnouts are expensive. Eliminate this expense with the Bi-Metal protection given in a Westinghouse Thermoguard motor. Thermoguard motors are available in sizes through 2 Hp single-phase, as well as in most fractional Hp ratings.

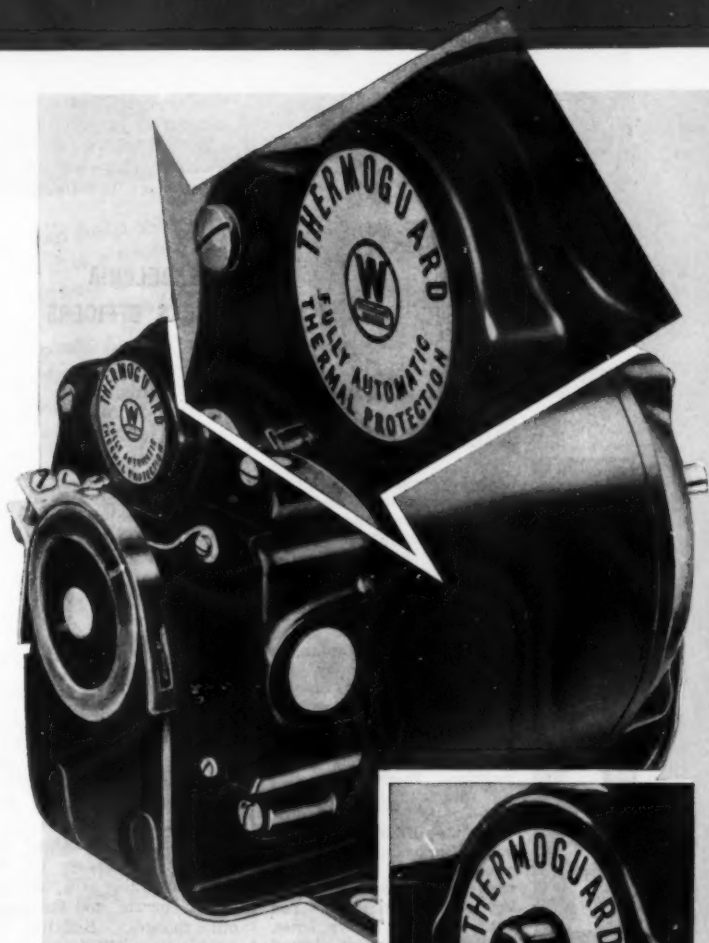
The snap-action Bi-Metal disc prevents burnouts. Any continuous or frequently repeated overload, high ambient temperature, high motor current, or other conditions that create dangerous temperatures, cause the Bi-Metal disc to open the circuit instantly before dangerous current values are reached—and keep it open until the motor temperature reaches a safe value.

The Thermoguard is connected and mounted inside the motor at the factory. No other connections or adjustments are necessary. There is nothing to tamper with and nothing to replace. It's a silent guardian always on the job.

To eliminate motor burnouts and save time, money and trouble, use Westinghouse Thermoguard motors.

J-90336

Westinghouse Electric & Mfg. Co.  
East Pittsburgh, Pa.



Thermoguard protection may be obtained fully automatic as above, or manually reset as at right.



# Motors and Control





## Simplified REFRIGERATOR SERVICING

• CAPACITORS •

It's easy—and mighty profitable—to service electric refrigerator capacitor-start motors the AEROVOX way.

With the Capacitor Selector shown above, you can immediately determine correct and safe capacity value for any motor, merely by clipping in circuit and flipping switches. When best starting torque is attained, within safe voltage limits and time, read total capacity from "On" switches. Then . . .

With the AEROVOX Emergency Capacitor, also shown above, plug in required sections to total required capacity, and clip in place. You get motor going in jiffy. Later, at your convenience, install an AEROVOX exact-duplicate capacitor for permanent job.

### Ask Your Jobber . . .

Let him show you these aids to prompt and profitable capacitor-start motor servicing. Ask for a copy of our latest industrial capacitors catalog—or write us direct.



[FROM PAGE 62]

Salt Lake City—37 certificates issued.  
Houston—Architects increasing allowances on building budgets.  
Omaha—182 certificates issued.  
Akron—30 certificates issued.

## NEW SECTIONAL IAEI PRESIDENTS

Blaine Grey, chief electrical inspector of Salt Lake City and former electrical contractor, was elected president of the Northwestern Section of the International Association of Electrical Inspectors.

The Southern Section chose C. S. Whitaker, city electrician of Durham, N. C., to direct its activities for the new year.

## PHILADELPHIA ELECTS OFFICERS

Officers just elected by the Board of Governors of The Electrical Association of Philadelphia are: President, A. L. Hallstrom, Atlantic District Manager, Graybar Electric Co.; vice-president, Howard L. Miller, president, Utilities Engineering Co.; treasurer, Philip H. Ward Jr., president, Ward Electric Co.; secretary, Robert J. Moran, Chief of Electrical Dept., Middle Department Rating Association.

## INSPECTION FEE SURVEY

The electrical contractors in northern New Jersey are dissatisfied with the variance in inspection fees in the different municipalities. They want a uniform fee throughout the section and, if possible, throughout the state.

The Essex Electrical League is conducting a survey of inspection fees throughout this area, and how the departments operate, and the basis for the various charges. Bulletins containing this information will be mailed to the league contractors and, if successful, this type of service will be continued as a permanent feature of league service.

## HOUSTON CONTRACTORS ORGANIZE

A new contractors organization has recently been launched at Houston, Texas. Manual de Bettencourt, Houston contractor, is president of the group. It is a chapter of the National Electrical Contractors Association.



**IDEAL**

*Wire Nuts*

(Solderless—Tapeless Wire Connectors)



The critical points in O.K.ing a wiring installation are the wire joints—Not The Wire! That's why wiring jobs pass inspection quick when Ideal "Wire Nuts" are used. Inspectors know Ideal "Wire Nut" joints are better electrically, stronger mechanically, unaffected by temperature changes, impervious to damage from cuts or abrasions.

**Skin Wires—Twist On—That's All!**

Make uniformly good joints.

Require no tools.

**Fully approved—Listed by  
Underwriters Laboratories, Inc.  
MILLIONS IN USE!**

FREE SAMPLES ON REQUEST

Electrical Products Division  
Ideal Commutator Dresser Company  
1041 Park Ave. Sycamore, Illinois



# BUCKEYE CONDUIT

Softens Up a Tough

*Specification*

● Here's the kind of job where Buckeye Conduit can help you make better time, keep down cost. Contractors call this a tough specification because those plate hangers are punched to size without clearance for a coupling and every length has to be inserted separately, a hole at a time and coupled in place. Tough on the contractor -- maybe -- but fine for the owners because of guaranteed freedom from vibration plus perfect spacing assuring a long and useful life.

Buckeye Conduit will speed up these tough jobs. Its highly uniform ductility makes it easy to throw a radius on a pipe. The threads come clean on the first cut, need no chasing, dies last longer and a coupling made up once is made forever.

Youngstown Buckeye Conduit Steel is carefully processed to produce a uniform ductility. The flexible lacquer lining is satin-smooth, offers a minimum resistance to fishing, and is tough. Fish wire won't scratch it, and a high non-ductivity factor is maintained with no flaking, no cracking.

Youngstown Buckeye Conduit works with you and for you on every job. With the help of Buckeye Conduit you'll make as good time on these tough ones as you might on less carefully drawn specifications.

## THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon and Alloy Steels  
YOUNGSTOWN, OHIO

### General Offices

Ask your distributor for Youngstown Conduit - Pipe and Tubular Products - Sheets - Plates - Tin Plate - Bars - Rods - Wire - Nails - Tie Plates and Spikes.

26-78

Control Board and Youngstown Buckeye Conduit in the new Toledo, Ohio, Vocational High School.

Supervising Architect -  
Edwin M. Gee, Toledo School Board  
Electrical Engineer -  
Gil Southern, Toledo, Ohio  
General Contractor -  
Henry J. Spieker Co., Toledo, Ohio  
Electrical Contractor -  
Romanoff Electric Co., Toledo, Ohio





## So MANY Places to Sell this OFFICE APPLIANCE LAMP

It's a lamp of many uses. Clamps to desk or can be screwed to wall or table. It swings to right or left, directing its strong indirect light just where needed, with no glare in the operator's eyes. With only a 100-watt bulb it delivers 30-35 foot candles of light to the machine. Besides its many uses in the office, this lamp is suitable for packing or wrapping bench, factory inspection tables, etc.—additional sales possibilities for an alert dealer.

## ONE OF OVER 200 LAMPS FOR EVERY LIGHTING NEED

No need to pass up ANY lighting order. The Faries catalog gives you a complete line to sell . . . a lamp for every requirement, together with brackets, fixtures and supplies. For over 59 years the Faries line has represented the best in portable lighting equipment.

## Send for This CATALOG



... Use it  
to sell more  
lighting  
equipment.



No. 2242  
Guardsman



No. 1909  
Natural Light



No. 2213  
Guardsman



No. 1941  
Executive



No. 141  
Adjust. Bracket



No. 10-000  
Bench Light

## FARIES MFG. CO.

S. Robert Schwartz Div.  
1004 E. Grand Ave.  
Decatur, Ill.

## In the News

[FROM PAGE 66]

## CHICAGO A-W SETS RECORD

Chicago reaped a bumper crop of adequately wired homes in 1939, according to A. A. Gray, manager of the Electric Association of Chicago, sponsors of the local Adequate Wiring Campaign. Figures for the year, as of Dec. 1, rolled up to 1896 certificates issued for detached residences and nine apartment houses certified, totaling 2589 "residential occupancies" or home units in all.

Several hundred "residential occupancies," now awaiting inspection, are expected to reach the minimum standard for certification. This is expected to push the year's total over 3000.

## WITH THE Manufacturers

Viking Air Conditioning Corp., Cleveland, has moved to larger quarters at 9500 Richmond Avenue, S.E.

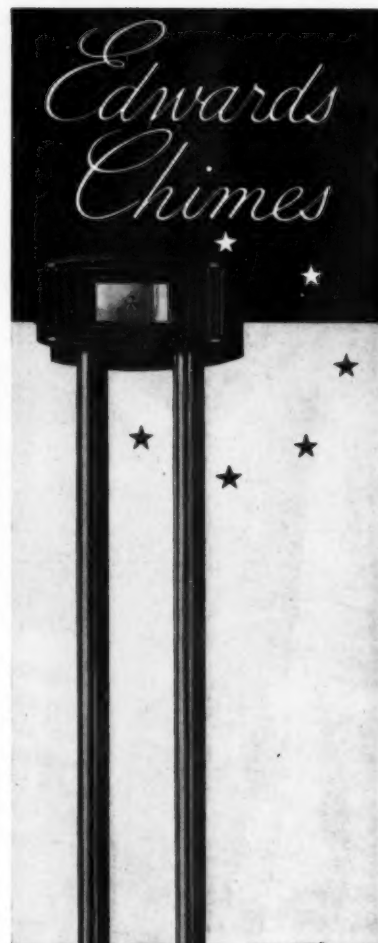
Graybar Electric Company announces the promotion of H. P. Litchfield to general commercial sales manager. He will be located at the New York general executive offices at 420 Lexington Avenue.

Wabash Appliance Corp., Brooklyn, N. Y., has acquired control of Birdseye reflector lamps. The manufacturing and sales staff of the former Birdseye Electric Corp. has been taken over.

General Electric Co. announces the appointment of L. T. Blaisdell as manager of the East Central District, succeeding the late W. J. Hanley. He was formerly located in Dallas and will be succeeded as manager of the Southwestern District by W. B. Clayton.

Perfex Corporation, Milwaukee, announces that L. B. Miller has joined its Automatic Control Division as a sales executive. He was formerly with the Polatron System of Refrigeration control.

Paragon Electric Co., Chicago, announces the appointment of Wilfred D. Goldschmidt as Cincinnati sales representative. Mr. Goldschmidt will offer the Paragon line to jobbers in central and Southern Ohio, Southern Indiana, Kentucky and Western Virginia.



*A  
Graceful note  
of Beauty  
for the Home..*

**ADDED** beauty because the Edwards line of door chimes is styled to **FIT** the decorative pattern.

Select the correct style at your electrical wholesaler's at the same time you choose other electrical fixtures.

Full color catalog of chimes will be sent to electrical contractors on request.

Address Department C-2.

## EDWARDS and COMPANY

NORWALK CONNECTICUT

Electrical Contracting, January 1940

## 1940 RESOLUTIONS

In order to serve my customers best, I resolve

**FIRST:** To sell them

# **AUTOMATIC ELECTRIC Private Interior TELEPHONE SYSTEMS**

*"Incidentally, it pays!"*

The axiom "Who Serves Best Profits Most" neatly sums it up.

When you sell one of these practical telephone systems you render your customer a real service by providing his shop, office or home with the means for fast interior communication to help him save precious time, steps and money. And, as the result of the sale, you earn an attractive profit.

If you are not now selling Automatic Electric intercommunicating systems, why not begin to do so at once? It will pay you two ways—in both goodwill and in dollars. Call in our local representative today! He'll be glad to help you get started.

### INTERCOMS

Available in both desk and wall styles. Equipped with molded plastic handsets. Common talking systems of two to eleven stations.

### SERV-U-FONES

Low priced, all metal telephones, in common talking systems of two to ten stations. Conveniently packaged and simple to install.



*These systems are designed for private service. They are not intended to be connected with the public telephone system.*

### IDEALFONES

Compact, wall type telephones with molded handsets. Offered with one or five buttons for common talking service up to ten stations.

### P-A-X's

Private automatic exchange systems, providing dial service and secret connections, from ten stations up. Telephones in a variety of types.

# **AUTOMATIC ELECTRIC**

## **PRIVATE INTERIOR TELEPHONE SYSTEMS**

Distributed by: **AMERICAN AUTOMATIC ELECTRIC SALES COMPANY, 1033 West Van Buren Street, Chicago, Illinois**

Sales and Service Offices in Principal Cities

In Canada: Canadian Telephones & Supplies, Limited, Toronto

*Electrical Contracting, January 1940*



# DEPENDABLY UNIFORM

## 4 GRADES OF GENERAL ELECTRIC BUILDING WIRE



Every coil or reel of G-E Building Wire is like every other coil or reel in its size and grade. All are made of the same high quality raw materials and are subjected to the same rigid specifications during manufacture.

Four standard grades of insulation are available—Code Grade, Performance Grade, Heat Resistant Grade and Moisture Resistant Grade. Each wire has its size, type, voltage and grade of insulation printed on the braid. Braids are available in different colors.

G-E Building Wire is easy to strip and solder. Diameters are uniformly small. Generous coatings of paraffin make wire pulling easy. For further information see the nearest G-E Merchandise Distributor or write to Section W-0131, Appliance and Merchandise Dept., General Electric Company, Bridgeport, Conn.

GENERAL ELECTRIC

More Gossip

### Baltimore Wants Separate Bids

The Electrical Contractor's Association of Baltimore has started a movement to have the electrical work on public construction submitted as separate bids. At present, in Maryland, these bids are submitted to the general contractor.



**AT ASILOMAR**—Frank Thomas, assistant manager of Valley Electrical Supply Co., Fresno, and in charge of its construction department, (left) is a leader in the Fresno Electrical Contractors Assn. Snapped at the recent convention of the electrical contractors of both northern and southern California at Asilomar, he is with Walter J. Walsb, attorney for the San Francisco contractors. Walsb gave a reading of his paper, "Competition and the Law" which was read for him at NECA convention in Philadelphia by Clyde Chamblin.

### Bigger Boxes

H. S. J. Towner of the Towner Electric Company in Des Moines, Iowa says that many contractors are making the mistake of using small switch boxes on jobs involving No. 12 and larger wires. The result is cramped leads, particularly on three-way circuits. Four inch square boxes with switch covers will more than pay their own way in labor saving at these spots.

### Motor Shops Court Maintenance Men

Three of Chicago's electric motor repair shops competed effectively with manufacturers for the attention and interest of electrical maintenance men at a recent electrical maintenance engineers' show in Chicago.

Excel Electric Service Co. used a display backed up by large photographic enlargements of their plant and equipment. Hohman & Hill Inc. displayed types of wire and insulation illustrating quality workmanship.

Sievert Electric Co. stole the show in one section of the exhibition by setting up a small shop in which one of their expert mechanics wound stators and armatures on the spot.

The easiest way to get ahead in electricity—

through the other man's experience as found in books



Whatever "getting ahead" means to you as an individual, there is no principle so important as backing up your brain with the other man's experience. Why spend time and effort to find out what has already been learned and put down for all to see in books? Here, for instance, are all the results of a rich experience in every stage of wiring, installation and contracting work gathered and set down for you in

Terrell Croft's

## AMERICAN ELECTRICIANS' LIBRARY

(6 volumes—over 2,000 pages—fully illustrated)

In six really magnificent volumes this library gives the most thorough, more complete and easiest-to-understand treatment of the more specialized phases of electrical practice in print today.

### "How" and "why" for Maintenance Men

The books show the best ways to make installations for every type of conduit wiring job—they tell how to handle every kind of lighting and switch problem—they give tips on shortcuts for saving time on routine jobs—they show the quickest and surest methods of locating and remedying circuit troubles. Alternating current armature winding, electrical machinery control diagrams and machinery erection are some of the things covered in detail.

### Diagrams

In all, these books contain more than 1,000 clear, easy to follow diagrams, with wiring instructions written in simple language. It is unnecessary to tell you how valuable is this one feature alone.

### Small monthly payments

You may examine these books for 10 days by sending the coupon below, filled out. In addition, if you decide to keep the books you have the privilege of paying for them in easy monthly installments while you use the books. Make sure you are not passing up your best bet for getting ahead. Mail the coupon today.

## EXAMINATION COUPON

McGraw-Hill Book Co., Inc.  
330 W. 42nd St., New York, N. Y.  
Send me Croft's American Electricians' Library, 6 volumes, for 10 days' free examination. If I find the books satisfactory, I will send you \$1.50 in 10 days, and \$2.00 a month until \$17.50 has been paid. Otherwise I will return the books postpaid.

Signature .....

Address .....

City and State .....

Firm or Employer .....

Position ..... E.C. 1-40  
(Books sent on approval in U. S. and Canada only.)

Electrical Contracting, January 1940

# cottage to castle..

## There's a TRUMBULL MULTI-BREAKER for every job you bid on

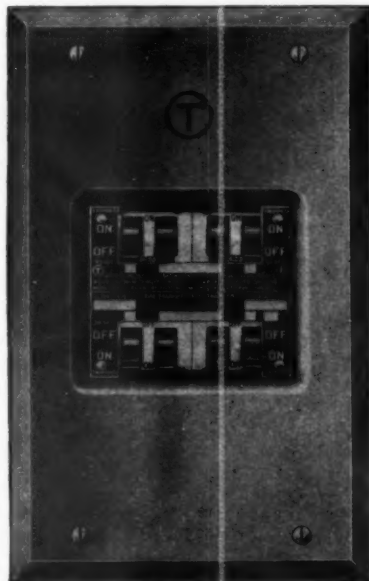
The Multi-Breaker idea is definitely accepted. Every architect and builder, and every home, store or building owner in your territory will quickly see the advantages of Trumbull Multi-Breakers, once you demonstrate their greater CONVENIENCE, SAFETY and ECONOMY.

Use the Multi-Breaker idea to get yourself more jobs and better jobs at a better profit.

Send for Trumbull Multi-Breaker Circulars 176, 320.



Type "MO" Multi-Breaker  
Surface Mounting



Type "MB" Multi-Breaker  
Flush Mounting

The Trumbull Multi-Breaker line covers five different types — each having its distinct place in the building field.

**Type MO** — Small, inexpensive, covers 1 and 2 circuits, 2 and 3 wire, up to 25 amp. capacity. Units mounted on a single block. Is also used for controlling motors, which interests the Industrial field.

**Type M-1** — From 1 to 6 circuits, 2 and 3 wire, up to 50 amp. capacity. Units mounted on a double block.

**Type MB** — 1 to 16 circuits, 2 and 3 wire, up to 100 amp. mains, 50 amp. branches. Units mounted on a four circuit block.

**Type M-2** — For circuits 50, 70, 90 or 100 amp. Used chiefly for large service entrance work. Also as disconnect and circuit protection.



Type "M-1" Multi-Breaker  
Flush Mounting



### TRUMBULLAIDS

#### For Contractors

The Trumbull Products shown in these advertisements are illustrated, described and listed in their Trumbullaid, in its divided circulars and in Trumbull 'Cheer'. Be sure your name is on our lists to receive all of these important documents.



NEW YORK - CHICAGO - BOSTON - DETROIT - ATLANTA - PHILADELPHIA - LUDLOW - NASHVILLE - LOS ANGELES - SEATTLE

# SHAWMUT

## IS THE WORD FOR FUSES



*Shawmut  
THERM-A-TRIPS  
won't blow when motors start  
on washing machines, refrigerators,  
oil burners and other  
electrical appliances*

### THERM-A-TRIPS



Cartridge  
type

*are the most  
economical,  
complete and  
flexible cir-  
cuit protection*



Tamper-Resisting  
base

The **CHASE-SHAWMUT  
COMPANY**



**NEWBURYPORT  
MASSACHUSETTS**

### Saw Mill Motor Maintenance

[FROM PAGE 17]

troubles. We follow that plan as consistently as possible. There is a short period between Christmas and February first when this mill, like most others, shuts down for general overhaul and repairs. I see that my motors go through this rehabilitation the same as other equipment, just as many of them as possible in the allotted time. They are taken in strict rotation and in the course of every few years each motor comes around to its turn. The motor, regardless of size, is taken down, cleaned and painted. The coils are looked after especially, using the best insulation compound, put on with a spray gun. The pulleys are taken off, rotors pulled and the job thoroughly done.

As stated, we almost never have a burn-out. The squirrel cage motors are almost proof against it. In the seven burn-outs we have had in 15 years, the reason has been shortage of oil in most cases. The bearing heats and the heat works back through the rotor, doing the damage. The sudden loads that some of these motors get may not be comparable to those in a steel mill, for example, but they are plenty heavy. In the case of a 300 hp. motor, the load may go from nothing to 800 amperes in less than a minute.

#### Rewinding Sent Out

There is not enough re-winding work to warrant the employment of a shop man for this purpose, or warrant carrying a stock of coils. Repairs, such as shaft and bearing work, we are able to handle in the machine shop of the mill. All rewinding is sent out.

The large size induction motors are provided with automatic remote control panels. As an example, take the 250 hp. motor which operates the gang saw. On this are mounted the relays and overload circuit-breaker; the main circuit-breaker, which is operated by remote control button; the closing contacts, and four secondary breakers. Fifteen seconds are required to bring the motor up to speed.

In the case of this panel, as with the others of similar character, it is the best insurance against trouble to inspect every day. The contacts must be watched very carefully. Have plenty of spares and at the first indication of deterioration of the surfaces renew rather than attempt to clean them where they are. The cleaning should be done by filing, in a vise, where accurate work can be done. At the same time, watch and fill the dashpots.

## Controlled Lighting for SHOW WINDOWS



More effective light per dollar of operating cost! Greater attention attracting power with the same light bill. That's what merchants want—and that's the **BIG FEATURE** of Sterling Lite-Flo Reflectors which has helped so many contractors get profitable store lighting contracts.



Send details for modern layout covering your next store lighting bid.

Catalog Mailed  
on Request

**STERLING REFLECTOR CO.**  
1435 West Hubbard Street, CHICAGO

## SEE FOR YOURSELF

How wires are wedged fast—  
gripped **completely around**  
in the **V-BOTTOM** wire  
opening of



### SOLDERLESS LUGS

Learn how fast you can  
make strong, neat solderless  
connections . . . with just  
your wrench, screw driver or  
pliers.

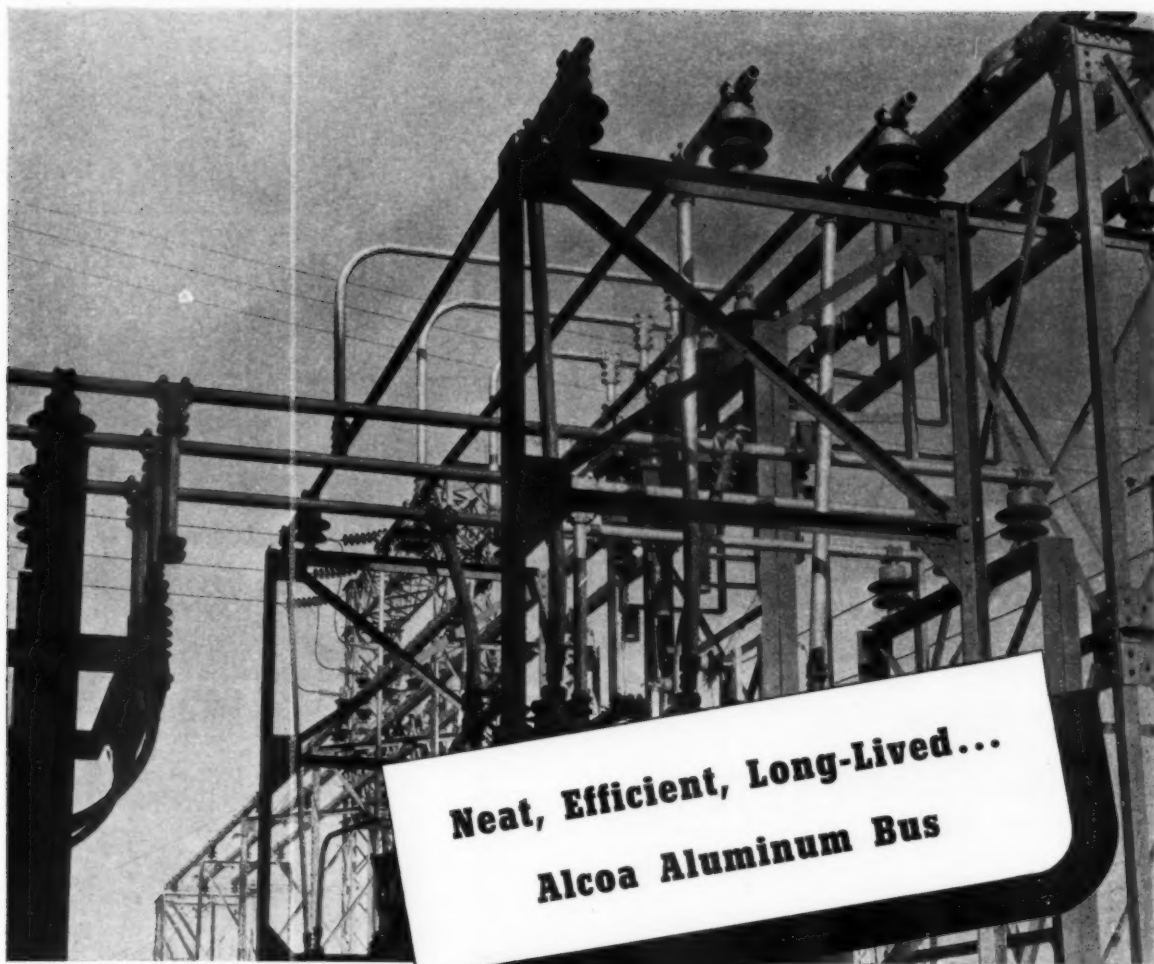
#### SEE ONE IN ACTION!

Write for Free sample—or  
better still, ask your Elec-  
trical Jobber for one.

DEPT. E C

**IlSCO Copper Tube & Products, Inc.**  
5629 Madison Road, Cincinnati, Ohio





**Neat, Efficient, Long-Lived...  
Alcoa Aluminum Bus**



Buses lined up perfectly, with bends formed to match exactly; this is an installation of which the workmen can well be proud. It will retain its fine appearance, too, for bus and fittings are Alcoa Aluminum.

Tubular Alcoa Aluminum Bus, though light in weight, is very rigid. Supports can be widely spaced. Weight of supporting structures can be lower, with the result that material and construction costs are less.

Alcoa Aluminum conductors, whether tubular, flats, angles or channels, offer a high degree of electrical and thermal efficiency.

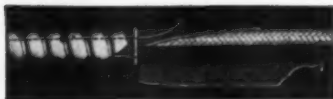
Simple, inexpensive fittings are available for use with Alcoa Aluminum Bus. Standard construction methods are employed; joints may be welded or bolted. If you are considering the installation of bus bars, write to us for recommendations. ALUMINUM COMPANY OF AMERICA, 2197 Gulf Building, Pittsburgh, Penna.



# EQUIPMENT *News*

## Armored Cable

A new double-bushed and bonded armored cable with an armor resistance not exceeding 1 ohm per 100 feet of armor. Uses a tinned copper bond wire bridging each armor convolution. Features of cable are: uniform resistance; definite resistance per unit length of armor; low resistance path to ground; provision against "hot spots" and protection against overheating of armor. Triangle Conduit & Cable Co., Inc., Elmhurst, New York, N. Y.



TRIANGLE ARMORED CABLE

## Control Station

A new three-button control station, designed for easy installation. Button mechanism is of unit type construction, mounted in a box which opens at front and two sides and has conduit opening at one end. With cover off, all terminals are in the open. Available with various button markings. Can be mounted in either vertical or horizontal position. Also, may be provided with a bar for locking "Stop" button in its open position. Maximum d.c. ratings of 1 ampere, 115-volt; 0.5 amp., 230-volt; and 0.25 amp., 550-volt. Maximum a.c. rating is 3 amperes, at 110-, 220-, 440- and 550-volt. Allen-Bradley Company, 1311 S. First St., Milwaukee, Wis.



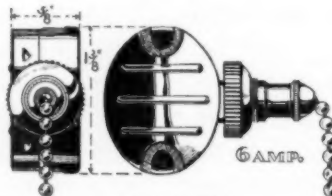
ALLEN-BRADLEY  
CONTROL STATION



G-E PYRANOL CAPACITOR

## Capacitor

A group of new Pyranol capacitor equipment, Class DTSR, for power-factor improvement in industrial plants. Designed to be mounted on platform, floor or suspended from ceiling. Bodies of units are exposed to stream of ventilating air, and bushings, buses and fuses are enclosed in dust-tight compartment. Conduit knock-outs provided on top and both sides. Resistors are built-in. Fuse clips and fuse ferrules are silver-plated. Switches may be mounted on pillars or walls when units are suspended from ceiling. General Electric Co., Schenectady, N. Y.



MCGILL SWITCH

## Switch

The No. 41 Levolver switch is designed for use on small power apparatus and for individual control of lighting fixtures in industrial plants, commercial institutions and public buildings. Listed by Underwriters' Laboratories, under "T" rating—6 amps., "T", 125 volts; or 3 amps., 250 volts. It is 1/2-in. thick but will take the initial surge of 48 amps. from a cold, type "C" lamp, eight times its rated capacity. McGill Manufacturing Co., Valparaiso, Ind.



BURNDY ELECTRICAL TERMINAL

## Electrical Terminal

An electrical terminal for joining two cables to a single terminal block. Double clamping elements on each cable provide an extra factor of safety. Body of terminal is silver plated to reduce contact resistance. Burndy Engineering Co., Inc., 459 East 133d St., New York.

## Fluorescent Lighting Unit

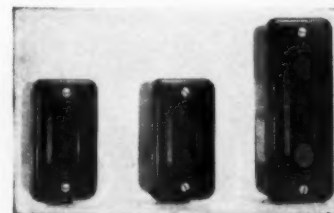
The "Day-Flo" fluorescent lighting is designed for general illumination of industrial areas. It uses two 40-watt, 48-inch fluorescent daylight lamps, in a porcelain enameled steel reflector. Available for 110-125 volt, 199-216 volt, or 220-250 volt, and furnished complete with sockets and Tulamp ballast equipment. Can be furnished wired or unwired. Wheeler Reflector Co., 275 Congress St., Boston, Mass.



WHEELER LIGHTING UNIT

## Pushbuttons

A new line of standard duty pushbuttons for a.c. and d.c. pilot circuits, for surface and flush mounting. It includes one double-circuit momentary-contact, spring-return button unit, made for auxiliary control in machine tool or similar operations. Two-button station provided for use with reversing starters. Three-button unit furnished where forward, reverse and stop operations are required. Watertight and flush mounting stations, units with rotary selector switch, and stations with safety latch to protect against closing of circuit by another operator or from another control point are also included in the line. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.



WESTINGHOUSE PUSHBUTTONS

**IS THIS**

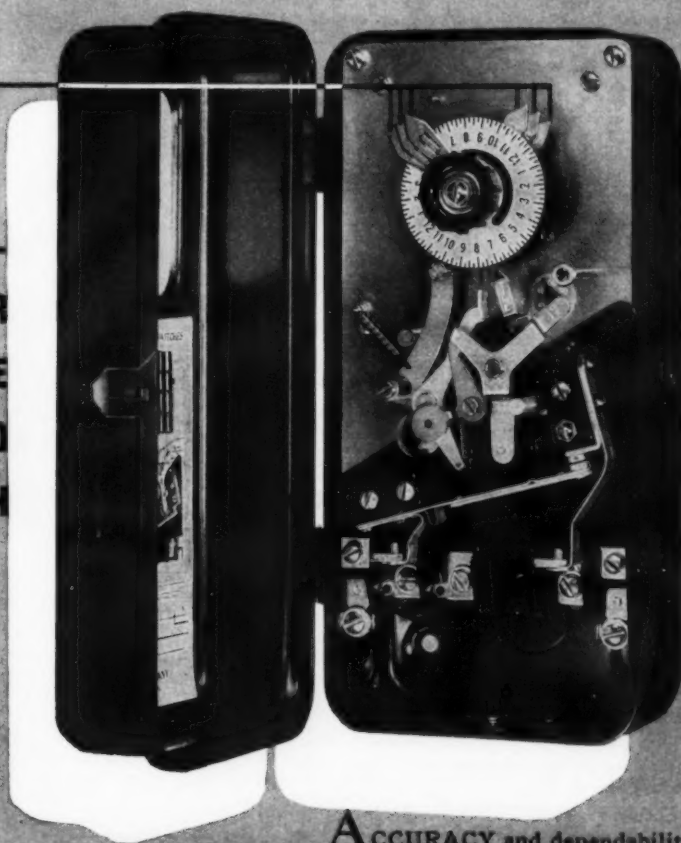
**ON THE TIME-SWITCH YOU NOW BUY?**

# FEATURE

**SIX LEVERS PROVIDING FOR EITHER ONE, TWO OR THREE COMPLETE "ON" AND "OFF" PERIODS EACH DAY.**



*Choose your time-switch from a complete, modern line! The new Catalog No. 1000 contains the full information and prices on all Sangamo Time-Switches.*



**ACCURACY** and dependability are unquestionably the primary requirements of a time-switch, but other features, such as flexibility of operation, are also highly desirable. The Sangamo Form KA Time-Switch illustrated above provides three pairs of operating levers, allowing up to three daily "on" and "off" periods—the levers can be set by simply loosening the dial knob. Buy this time-switch! Its slightly higher price is definitely offset by its additional features of convenience, dependability and accuracy.

**SANGAMO ELECTRIC COMPANY** **SPRINGFIELD ILLINOIS**



## SURFOLETS



No. 8400. This base standard under all Surfolet outlets

No. 8460 Pull Chain Lamp Base

No. 8420 Keyless Lamp Base

No. 8410 Tumbler Switch

No. 8430 Duplex Flush Receptacle

No. 8440 Rosette

No. 8450 Blank Junction Box



## Quickly Installed with More PROFIT

Contractors everywhere have found that surface wiring installations can now be made in considerably less time and with more profit for themselves.

This is made possible by exclusive and unique design of Surfolet surface wiring devices which speed installation and cut down the amount of material used on each job. No clamps, connectors or grounding are necessary.

Attractive appearance, safety and economy provide distinct customer appeal.

Underwriters' approval is your assurance of complete safety and protection.

Write for full details today

**PORCELAIN PRODUCTS, INC.**

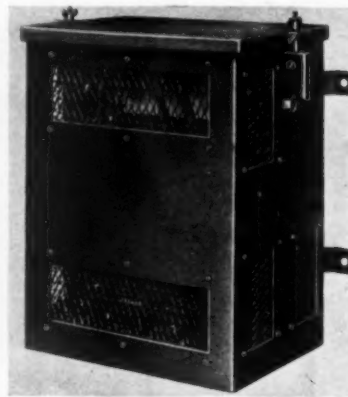
FINDLAY, OHIO

## EQUIPMENT News

[FROM PAGE 74]

### Transformers

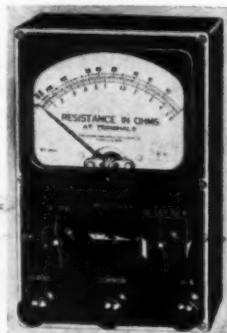
A new line of air-cooled transformers for operation of industrial equipment. Sizes up to 750 va. capacity have compound filled cases with terminals, leads and mounting feet. The 1000, 1500 and 2000 va. units are supplied in ventilated, air cooled, sheet steel cases. Ferranti Electric, Inc., 30 Rockefeller Plaza, N. Y.



FERRANTI TRANSFORMER

### Instrument

This Hickok Ohmmeter, Model 4975-S, may be used for measurements in any very low resistance circuit. It has a 4-inch rectangular meter with 3½-in. scale length. Two ranges at 0-6 and 6-600. It is non-overlapping in two ranges, permitting battery adjustment at logarithmic center. Instrument is self-contained, utilizing three replaceable flashlight cells. Special low resistance leads of No. 8 stranded, rubber insulated wire are provided with large surface clips at each end. Hickok Electrical Instrument Co., 10514 Dupont Ave., Cleveland, Ohio.



HICKOK OHMMETER

## An electrical book that is *different*—

Do you know the rules affecting the over-current units for high voltage circuit breakers? — for motor circuit protection? — for motor running protection?

How long would it take you to find them and understand them from an ordinary reference to the Code?

In Abbott's Handbook you

can find all the rules affecting these questions in an instant. And you will find them clearly explained in simple language with diagrams and illustrations to make them easier for you to understand quickly.



## NATIONAL ELECTRICAL CODE HANDBOOK

by ARTHUR L. ABBOTT

Fourth Edition, 563 pages, \$3.00

A PRACTICAL, how-to-do-it handbook, covering the complete contents of the 1937 National Electrical Code, with many definitions, illustrations, methods, data and explanations to show what the Code means and how to apply it.

*How to handle all kinds of wiring and installation jobs strictly in accordance with the Code*

Commercial Build-  
ings  
Homes  
Factories  
Outside Work  
Hazardous Locations  
Theatres  
Emergency Lighting

High-voltage Equip-  
ment  
Signal Systems  
Motor Installation  
Services  
Grounding  
Design of Installa-  
tions

### MCGRAW-HILL ON-APPROVAL COUPON

McGraw-Hill Book Company, Inc.  
330 W. 42nd St., New York, N. Y.

Send me Abbott's National Electrical Code Handbook for 10 days' examination on approval. In 10 days I will send \$3.00, plus few cents postage, or return book postpaid. (Postage paid on orders accompanied by remittance.)

Name .....

Address .....

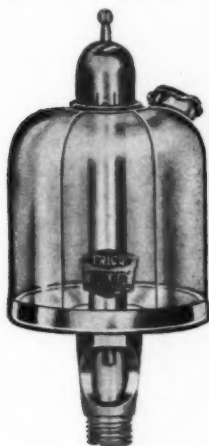
City and State .....

Position .....

Company ..... E.C. 1-40  
(Books sent on approval in U. S. and Canada only.)

## Feed Oiler

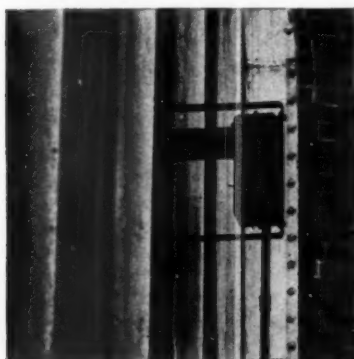
A new line of visible gravity feed oilers, with unbreakable reservoirs. Oiler is mounted at top of part to be lubricated and any pre-determined number of drops of oil per minute can be obtained by an adjustment of ratchet control. Shut-off lever at top feeds oil, when in vertical position, stops flow when tilted to side. Equipped with dual ratchet springs and heavy tension ring that fits over ratchet springs. Filler-cap is dust-proof and self-closing. Made in three styles, in one, two, four and eight ounce capacities. Trico Fuse Mfg. Co., Milwaukee, Wis.



TRICO  
FEED  
OILER

## Smoke Control

Photoswitch smoke control, Type A20C, indicates by a bell or other signal located in the boiler room when smoke passing through a furnace flue exceeds a predetermined density. Control and light source are mounted on opposite sides of flue or chimney on brackets. A light beam projects through a small opening in the flue, across the chimney through a second opening to the eye of control. A bell or light signal is located at any convenient point, and wired to the control housing. A small knob outside the switch can be set so that the signal operates at any predetermined smoke density. For 110 volt a.c. circuit. Photoswitch Incorporated, 21 Chestnut St., Cambridge, Mass.



PHOTOSWITCH SMOKE CONTROL

Electrical Contracting, January 1940

# TIME is your Partner in Profits



When you save Time in electrical installation, it becomes an important Partner in profits. This partner becomes especially

important when Time Estimates are cut as a result of short cuts through adoption of modern methods... When you use Burndy Connectors you may be sure that Time, your partner in profit is working with you.

CONSULT YOUR WHOLESALE  
FOR DETAILS ON THIS ITEM



# BURNDY Qiklug

# Badger

## Synchronous ELECTRIC TIME SWITCHES



### CONTRACTORS LIKE THEM BECAUSE:

they are dependable and easy to install

### USERS LIKE THEM BECAUSE:

of economical operation and low cost

The Badger line of Time Switches is always in demand by Contractors who want dependability, accuracy, and the right type for a specific need. They know from experience that this is the line that gives them successful, profitable installations. They know when they install Badger Synchronous Electric Time Switches for their customers they are giving them complete satisfaction—accurate timing, economical operation, dependable service. You can't go wrong on Badger. Write for more particulars or see your Wholesaler.

**RELIANCE AUTOMATIC LIGHTING COMPANY**  
1937 MEAD STREET RACINE, WISCONSIN

FOR FAST INSTALLATION  
and POSITIVE CONTACT... USE

## Sherman Ground Clamps



"Bonded," ground rod clamp. Heavy extruded bronze. Bronze screw with cap point. Strong one-piece construction.



Patented construction. Wire may be soldered to roll end, or clamped under washer. Made of pure copper, partially formed for easy installation.



Heavy duty cast bronze ground clamp for exterior ground connections. No loose parts.

There's a Sherman clamp for every type of job. See them, and try them yourself. You'll find IT PAYS to buy "Sherman."

**W. B. SHERMAN MFG. CO.**  
BATTLE CREEK, MICH.

## FLUORESCENT

*Lighting*  
*by Efcolite*

Announcing  
Our New  
Fluorescent Catalog

Showing the lighting of tomorrow here today is the new Efcolite Catalog. An entirely new line of Fluorescent lighting that covers all possible requirements for Office, Commercial, Industrial and Residential Illumination. Features that are modern, efficient, attractive, adaptable and economical in installation and operation.

EFCOLITE CORPORATION

Passaic, New Jersey

Write for Catalog

EQUIPMENT *News*

[FROM PAGE 77]

### Reflector

Angle Standlite is a new reflector for illuminating lot corners, driveways, alleyways and other types of outdoor areas. It regulates distribution of light, trims it sharply to the ground in one direction and projects it in the other by means of an adjustable inner reflector and a semi-circular louvre attachment. Can be mounted from 10 to 12 feet high. It is weather-proof. Goodrich Electric Co., 2901 N. Oakley Ave., Chicago, Ill.



GOODRICH ANGLE STANDLITE

### Sunlight Lamp

A new 100-watt Type S-4 sunlight lamp is designed for use in the home as well as animal and poultry farming. The new lamp, a bulb within a bulb, produces approximately four times as much ultraviolet per watts consumed as Type S-1. Can be operated only in equipment made for its use. Outer bulb is same size and shape as the ordinary 60-watt lamp. Made of clear ultraviolet transmitting glass, outer bulb screens out undesirable short rays emitted by inner element. General Electric Co., Nela Park, Cleveland, Ohio.

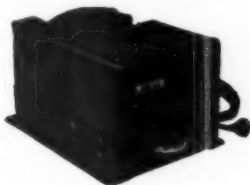


G-E SUNLIGHT LAMP



### Wire Stripper

A new power-driven, brush-type wire stripper. A vacuum attachment draws insulation materials into drawer in base of unit, eliminating dust and dirt. It strips cotton and enamel, silk and enamel, string asbestos, flat or rectangular solid or stranded wire. Operates by single, direct-belt drive from  $\frac{1}{4}$  hp. motor to steel wire brushes. Speeds of brushes are synchronized through an auxiliary, flat-belt drive, which operates vacuum exhaust. Ideal Commutator Dresser Co., 1041 Park Ave., Sycamore, Ill.



IDEAL WIRE STRIPPER

### Lighting Equipment

Plastic Directlights use a translucent plastic as the reflecting surface. Lamp is concealed by a radial louver and band. An adapter socket is supplied on No. 2656D for 200 or 300 watt inside frosted lamps. Same type of reflector available in a semi-rigid hanger type finished in satin aluminum. Larger type is available using 300 or 500 watt lamps. F. W. Wakefield Brass Co., Vermilion, Ohio.



WAKEFIELD DIRECTLIGHT

### Lamps

A new type of Mazda lamp including a reflector inside the bulb. Lamps are made with a flared bulb, coated on inside of flare with metal. Lamps are for use primarily in show windows but will find many other uses wherever a self-contained unit is required. Equipped with medium screw base fitting ordinary socket. Lamps are rated 150 watts and available for 110, 115 and 120 volt circuits. Rated life is 1000 hours. May be used with color screens when desired. Lamp is made in two types—first called Projector Lamp is in a PAR-38 bulb; second Reflector Lamp is in an R-40 bulb. Westinghouse Electric & Mfg. Co., Bloomfield, N. J.

*Electrical Contracting, January 1940*



*Now—A NEW*



*Fluorescent  
Fixture*

Industry may now enjoy a new high standard of general "daylight" illumination for its varied lighting requirements with this new R. L. M. fluorescent fixture. It brings continuous good vision under cool, diffused light—without heat or glare. For ample intensity and proper distribution of light, the Goodrich R. L. M. Fluorescent Fixture uses two 48" fluorescent lamps, and is equipped with auxiliaries which correct for power factor and flicker.

### Finished in Permanent Porcelain Enamel

The better diffusing surface of porcelain enamel minimizes glare, and provides an even distribution of light. Porcelain enamel is unaffected by atmospheric conditions; does not corrode or deteriorate, is easily cleaned to retain its original high efficiency. Catalog sheets will be sent on request.

*Sold only through electrical wholesalers*

MEMBER OF R. L. M. STANDARDS INSTITUTE

**GOODRICH**  
ELECTRIC COMPANY  
OFFICES IN ALL PRINCIPAL CITIES

GENERAL OFFICES AND FACTORY: 2902 N. OAKLEY AVENUE, CHICAGO, ILL.

# LOXON GRIPON

guard against  
breakage and theft!



**THE  
NEW  
LOXON**  
No. 1427-A



**THE  
NEW  
GRIPON**  
No. 1602-A



The McGILL LoXon Guard is your best assurance for protection against breakage and theft because it locks on with a key! However, where theft is a minor issue, the Gripon is fully as effective against breakage. The only difference in construction is that the key locking device on the LoXon is replaced by plain steel screws on the Gripon. New improvements have recently been made on these two guards:

1. Shape has been changed to conform to new style lamps.
2. Heavier wire is used — No. 14 instead of No. 15.
3. Both LoXon and Gripon are available with or without reflectors.
4. There is NO increase in price — only increased value for the user!

You may order these guards from your wholesaler.

**McGILL MANUFACTURING CO.**  
Box No. 670 VALPARAISO, IND.

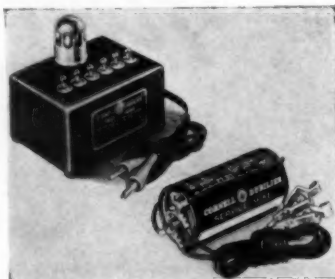
# McGILL

## EQUIPMENT *News*

[FROM PAGE 79]

### Instruments

New test instruments for use in replacing capacitors in motor-starting circuits. The "Test-Mike" is a multiple-capacitor unit of a.c. electrolytic type, with six toggle switches, which provide twelve capacity values ranging from 18.75 to 150 mfd. The "Service-Mike" provides same capacity range as the "Test-Mike" but the twelve variations are obtained through different interconnections of its four terminals. Cornell-Dubilier Electric Corp., South Plainfield, N. J.



CORNELL-DUBILIER INSTRUMENTS

### Duplex Receptacle

A new duplex receptacle for heavy-duty appliances, motor and heating loads requiring polarized circuits. Rating is 20-ampere, 250-volts. It uses a 2-wire Bakelite polarized cap with metal cord grip. Fits standard shallow wall box and takes standard duplex plates. Four binding screws for heavy wire are conveniently located for side connections. Arrow-Hart & Hegeman Electric Co., Hartford, Conn.



ARROW-HART & HEGEMAN RECEPTACLE

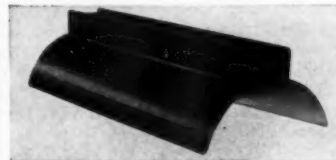
### Arc Welder

A small arc welding machine designed for use by garages, job welding shops, contractors, machine shops. "Shield-Arc Junior" is for engine or electric motor drive, with either bare or shielded arc type electrodes. Rated at 200 amperes with a current range, on welding duty, 30-volt arc, from 60 to 250 amperes. Has dual continuous control, permitting independent adjustment of voltage and current. Equipped with Class B (non-inflammable) insulation, it can be operated with relatively large size electrodes at high

## Reflecto Duct\*

FOR FLUORESCENT —

**NOW MADE FOR  
TULAMP BALLASTS**



These Tulamp Ballasts will operate Two Lamps, with separate starting switch, at high power factor and with less flicker.

**Made in two Types  
for 36" and 48" lamps**

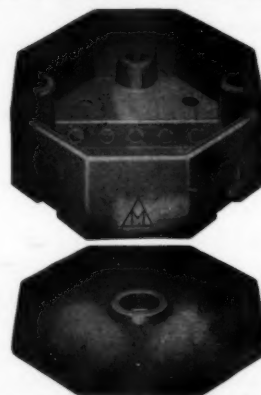
Model Tulamp-36—\$12.50 List  
Model Tulamp-48—\$15.50 List

Ballast, lamps or sockets not included. Write for circulars.

**REFLECTORS, INC.**  
3225 FRANKFORD AVENUE  
PHILADELPHIA, PA.

\*Registered U.S. Patent Office and Patent Pending

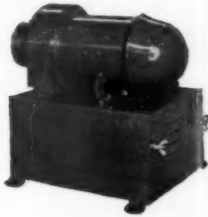
## Profit by USING ILLINOIS Dependable Porcelain OUTLET BOXES



\* Glazed and unglazed styles conforming to all existing standards of dimensions, spacing, position of knockout holes, and mounting screws. High mechanical and electrical efficiency. Contractors who use these products not only establish themselves most securely with their customers but also build their business by making each job a true quality one. Send for bulletin.

**ILLINOIS ELECTRIC PORCELAIN CO.**  
MACOMB, ILL.

average current without danger of burning out. Generator is single operator, variable voltage type, with laminated pole pieces. Lincoln Electric Co., 12818 Coit Road, Cleveland, Ohio.



LINCOLN ARC WELDER

### Resistor

Small "Ohiohm" ceramic-insulated, wire-wound resistors for general industrial plant uses such as motor-starters and relays and on photo-electric safety and counting devices. Standard units are from 5 watts to 20 watts in a range of resistance values. Axial terminal wires are used, of "U" or hairpin shape. After winding, wire is covered with baked-on ceramic coating which resists heat, moisture and vibration. Ohio Carbon Company, 12508 Berea Road, Cleveland, Ohio.



OHIO CARBON RESISTOR

### Solderless Lugs

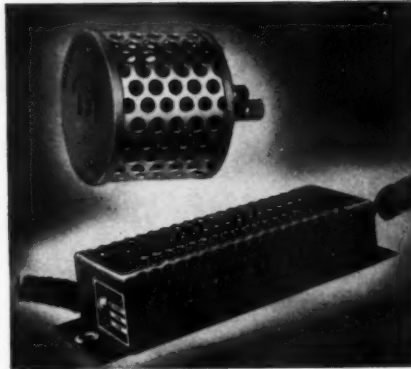
A new line of solderless lugs to accommodate all wires from No. 14 to 4/0. All lugs can be used on stranded, solid or flexible cables. Lugs are cadmium plated to prevent corrosion. Plate can be bent to make an angle lug. Outside band on largest size lug is made of Everdur, and will withstand all atmospheric conditions, including immersion in acids and alkalis. Frankel Connector Co., Inc., 177 Hudson St., New York, N. Y.



FRANKEL FLEXILUG

## For Information on FLUORESCENT LAMP RESISTORS

Send for  
Bulletin No. 26



The present interest in Fluorescent Lighting has made a problem for the contractor operating in areas served by D.C. current. He will find the solution in the Ward Leonard Line of Fluorescent Lamp Resistors for both portable and stationary installation.

## WARD LEONARD ELECTRIC COMPANY

28 South Street

Mount Vernon, N. Y.

## WARD LEONARD

Electric Control Devices Since 1892

**Why Not?** *Have Your Personal Accident and Health Insurance With . . .*

## EASTERN COMMERCIAL TRAVELERS

Mutual Company • No Agents • No Branch Offices

MASSACHUSETTS CO., INC. 1894

**ACCIDENT POLICY PAYS**  
ACCIDENTAL DEATH \$5,000-\$10,000  
WEEKLY DISABILITY \$25.00-\$50.00  
Estimated Annual Cost \$15.00

**HEALTH POLICY PAYS**  
\$25.00 Per Week for Confining Sickness  
\$10.00 Per Week for Non-Confining Sickness  
Estimated Annual Cost \$18.00

**PAYS WHILE YOU ARE LAID UP — PAYS FROM THE FIRST DAY OF DISABILITY — 45 YEARS OF UNFAILING SERVICE**

No Policy Is Cancelled, Rates Increased, or Benefits Reduced on Account of Any Age!

**SEND THE  
COUPON  
TODAY**

John S. Whittemore, Sec.-Treas.  
Eastern Commercial Travelers  
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Without obligation, please send complete information and application for membership to

Name .....

Address .....

City ..... State .....

EC-40



## FLOOR BOXES and WIRING SPECIALTIES

### No. 330 "LATROBE" TOM THUMB UTILITY OUTLET



For use in wood installations and other locations free from moisture or mechanical injury.



### No. 252-R TWO GANG BOX

Two gang adjustable floor box with No. 208 receptacle in one section. One cover plate with 1/2" flush brass plug and the other cover with 2" flush brass plug.

### No. 110 NON-ADJUSTABLE WATERTIGHT FLOOR BOX



Cutaway view showing how tapered unit receptacle fits tapered opening in top of box body. The last word in design, appearance, and simplicity of installation.

\* The Latrobe Line is complete for all residential, commercial, and industrial requirements. In addition, the entire line is designed with the idea of reducing installation time... an important point to consider when selecting floor boxes and wiring specialties

*Write for details TODAY!*

**FULLMAN MFG. CO.**  
LATROBE • PENNA.

## EQUIPMENT *News*

[FROM PAGE 81]

### Belt

Multiple belt for use on variable speed drive motors. Speed changes on unit are effected by turning hand wheel, which shifts motor on base and moves yoke which actuates pulleys. A new lubrication system provides for greasing. Belt may be tightened or loosened without shifting entire base. U. S. Electrical Motors, Inc., Los Angeles, Calif.



U. S. MOTORS BELT

### Clamp

ACSR clamps for use with aluminum conductors, steel re-inforced over armor rods in rural lines. Can be installed over rods without removing bolt. One piece construction. Has large groove for ACSR with armor rods and small groove for tap off wire. Made in two types—for No. 4 to 1/0 ACSR over armor rods and No. 8 to No. 2; for No. 4 to 1/0 ACSR over armor rods, tap off wires up to No. 2. H. B. Sherman Mfg. Co., Battle Creek, Mich.



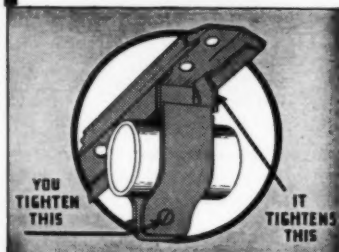
SHERMAN ACSR CLAMP

### Motors

Line of explosion-proof direct current motors now produced as large as 75 hp. Designed to operate safely in places made dangerous by presence of gases and vapors, of methane, acetone, benzene, various alcohols, common pyroxylin solvents and of various petroleum distillates, including gasoline. Available in complete range of sizes from 1 hp. up to 75 hp., approved by Underwriters' Laboratories, for Class 1

*With Only One Screw  
to Tighten. . . .*

## THE CLEVELAND CONDUIT HANGER



*Gives You a Quicker  
Easier Installation*

**"CONVINCE YOURSELF"**

*"Send for Circular  
Giving Full Details"*

**THE CLEVELAND SWITCHBOARD CO.**  
2927 E. 79 St. Cleveland, Ohio

## HERWIG

### OUT-DOOR LIGHTING FIXTURES

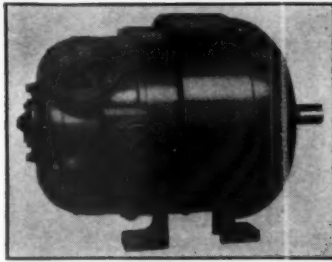


Apartment-Buildings  
Public Buildings  
Bungalows  
Churches  
Schools  
Garages  
Country Clubs  
Warehouses  
Residences

**A FIXTURE FOR EVERY  
OUTDOOR PURPOSE**

Send for our  
**CATALOGUE NO. 40**  
with NEW SUPPLEMENT  
and REVISED PRICE LIST  
*200 Illustrations*

*The*  
**Herwig Company**  
MANUFACTURERS  
Established 1908  
1753-59 Sedgwick Street  
Chicago, Illinois, U. S. A.

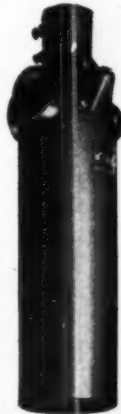


RELANCE ELECTRIC MOTOR

Group D hazardous locations. Reliance Electric & Engineering Co., 1088 Ivanhoe Road, Cleveland, Ohio.

### Transformers

Two new types of transformers designed to operate two 4-watt mercury lamps. Indoor type is rectangular for wall or post mounting with brackets, and with terminals made accessible by small doors at top and bottom. Weatherproof pole mounting type has terminals accessible at bottom and three threaded hubs so that up to three fixture mounting supports may be used. Jefferson Electric Co., Bellwood, Ill.



JEFFERSON  
TRANSFORMERS

### DISTRIBUTORS WANTED

We have just put on the market a new product, the TELETOUCH ELECTRIC EYE, list price \$49.50, for which we seek an exclusive distributor in your territory.

Write for bulletin outlining the unlimited fields and profit possibilities of this amazing product.

**TELETOUCH INDUSTRIES, INC.**  
37 West 54th Street  
New York City

*Reach out  
for NEW business  
with Wiremold*

**WIREMOLD  
FLUORESCENT LIGHTING**

Right now is the time to take full advantage of the many business building opportunities opened up by this new and revolutionary type of lighting for display, commercial and industrial installations. Wiremold Fluorescent Lighting is economical, easy to install and includes the special raceways, fittings and scientifically correct reflectors necessary for efficient application of Fluorescent Lighting.

Here's the up-to-the-minute information you need on how to sell and install Fluorescent Lighting



Wiremold data sheets and engineering service are yours for the asking. Send us the information on Fluorescent jobs in your territory and let us help you turn them into profitable contracts.

**WIREMOLD**

*Your BUSINESS BUILDER*

THE WIREMOLD COMPANY

HARTFORD, CONN.

### NOW

**A QUALITY VENT FAN AT  
STARTLING LOW PRICE!**

● Here's a brand new line of low priced, feature-plus Ventilating Fans—the Challenger Line. These fans are modernly different in appearance yet characteristic of the well known Signal performance and dependability. Outstanding features of these fans include:

Streamline Design—Totally enclosed motor—Self-Lubricating bearings, with wool-packed oil reservoir—Chrome plated fan blades—Quiet operation—Easy-to-mount frame.

Available in 3 sizes, 10"—\$9.90 List; 12"—\$12.50 List; 16"—\$16.50 List. These Challenger Vent Fans are adaptable for installation in walls, windows and transoms. Write for complete information now.

**SIGNAL ELECTRIC MFG. CO.**  
MENOMINEE, MICHIGAN

**SIGNAL**

### FOR PERFECT CONNECTIONS



**A SCREW DRIVER  
.. and a TWIST**



**The MARR connector**

#### FREE SAMPLE

If you're like other successful contractors, you'll say: "Sure, I'd like to try a MARR". Just pick up a post card—and tell us where to send it—free, no obligation!

**THE RATTAN MANUFACTURING COMPANY**

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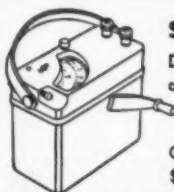


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Conduit  $\frac{3}{8}$ "— $2\frac{1}{2}$ "  
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# SQUARE D

## MULTI-BREAKERS IN AMERICA'S LARGEST PRIVATELY OWNED COMMUNITY OF LOW RENTAL HOMES ★ ★



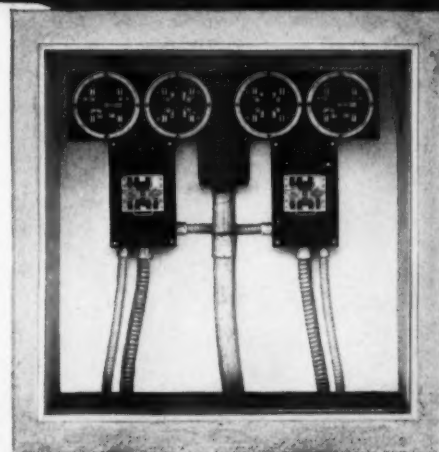
Above: The Wyvernwood Community in Los Angeles is three-quarters of a mile wide. 148 buildings will accommodate 1102 families.

At Right: Typical building. Architecture is modern and plot layout provides large open areas for adequate natural light and air. Apartments will rent from \$25 to \$45 per month, depending on location and size.

● An outstanding feature of this unusual community development is the electrical conveniences provided. Electric water heaters, electric refrigerators and electric bathroom heaters are "standard equipment" throughout. In addition, most of the apartments are equipped with electric ranges.

Significantly, a Square D Multi-breaker is the service entrance equipment for every apartment. Thus, Wyvernwood residents will enjoy modern protection against dangerous overloads—will be forever free of the inconvenience and annoyance of changing fuses.

Whether it's a modest cottage, costly home, or modern apartment—whether it's one, a dozen, or a hundred—the Square D Multi-breaker lays the foundation for better and more profitable wiring jobs—paves the way for more outlets and appliances.



Above: Each apartment is equipped with a Square D Multi-breaker with circuits for electric range, electric water heater, and lighting. Each installation has a master meter and a sub-meter for the water heater. Square D meter trough is used for a neat wiring job.

### SQUARE D COMPANY

DETROIT - MILWAUKEE - LOS ANGELES

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### Uniformly High Quality

But even more important, when G-E materials are installed, the resulting wiring system can be depended upon to give your customers years of satisfactory service. The quality of all G-E wiring materials is uniformly high. Only the finest raw materials are used. Rigid specifications govern the manufacture of all materials.

For more information about the G-E quality conduit and conduit products, wiring devices, or wire and cable, see the nearest G-E Merchandise Distributor, or write to Section CDW-0121, Appliance and Merchandise Department, General Electric Company, Bridgeport, Conn.



